ISOLATED DC-DC CONVERTER
CHB100 SERIES
APPLICATION NOTE

Approved By:

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Contents

CHB100 Series
Application Note V12 October 2020

1. Introduction

The CHB100 series offers 100 watts of output power with high power density in an industry standard half-brick package. The CHB100 series has wide (2:1) input voltage ranges of 18-36VDC, 36-75VDC and provides a precisely regulated output. This series has features such as high efficiency, 1500VDC isolation and a case operating temperature range of -40°C to 100°C. The modules are fully protected against input UVLO (under voltage lock out), output short circuit, output over voltage and over temperature conditions. Furthermore, the standard control functions include remote on/off and output voltage trimming. All models are highly suited to telecommunications, distributed power architectures, battery operated equipment, industrial, and mobile equipment applications.

2. DC-DC Converter Features

- 66-100W Isolated Output
- Efficiency to 89%
- 500KHz Switching Frequency
- 2:1 Input Range
- Regulated Outputs
- Five-Sided Metal Case
- Continuous Short Circuit Protection
- Half-Brick Size Meets Industrial Standard
- UL60950-1 Approval
- Without Tantalum Capacitor Inside (Except 3.3&5Vout)

3. Electrical Block Diagram

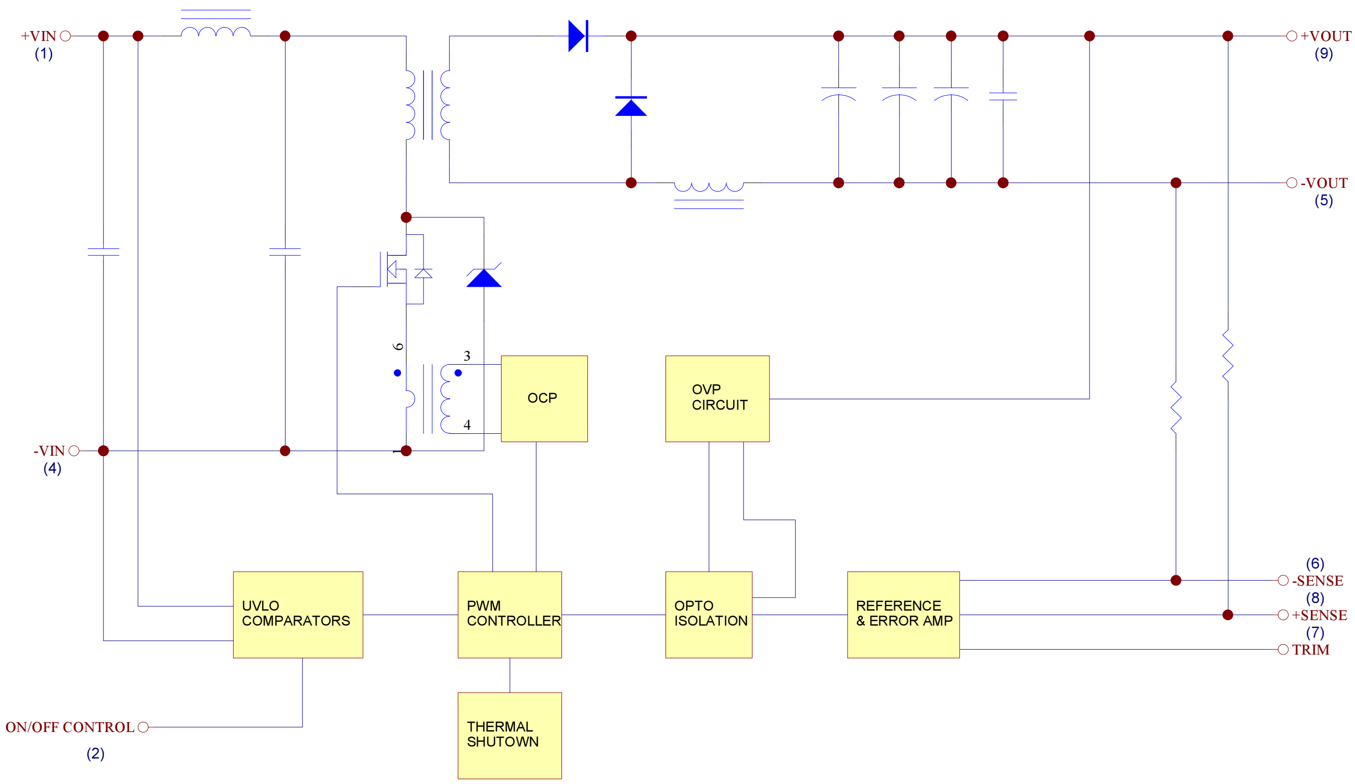


Figure 1 Electrical Block Diagram of CHB100 Series Module

4. Technical Specifications

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input Voltage						
Continuous		$24V_{in}$ $48V_{in}$	-0.3 -0.3		36 75	V_{dc}
Transient	100ms	$24V_{in}$ $48V_{in}$			50 100	V_{dc}
Operating Case Temperature		All	-40		100	°C
Storage Temperature		All	-40		105	°C
Isolation Voltage	1 minute; input/output, input/case, output/case	All	1500			V_{dc}

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Input Voltage		$24V_{in}$	18	24	36	V_{dc}
		$48V_{in}$	36	48	75	
Input Under Voltage Lockout						
Turn-On Voltage Threshold		$24V_{in}$		17		V_{dc}
		$48V_{in}$		34		
Turn-Off Voltage Threshold		$24V_{in}$		16		V_{dc}
		$48V_{in}$		32.5		
Lockout Hysteresis Voltage		$24V_{in}$		1		V_{dc}
		$48V_{in}$		1.5		
Maximum Input Current	100% Load, V_{in}=18V	24S33		3.4		A
		24SXX		6.7		
	100% Load, V_{in}=36V	48S33		2.3		
		48SXX		3.3		
No-Load Input Current		All		50		mA
Inrush Current (I^2t)		All			0.1	A^2s
Input Reflected Ripple Current	P-P thru 12uH inductor, 5Hz to 20MHz	All		30		mA

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	V_{in}=Nominal V_{in}, $I_o = I_{o\_max}$, Tc=25°C	Vo=3.3V	3.267	3.3	3.333	V_{dc}
		Vo=5V	4.95	5	5.05	
		Vo=12V	11.88	12	12.12	
		Vo=15V	14.85	15	15.15	
		Vo=24V	23.76	24	24.24	
Output Voltage Regulation						
Load Regulation	$I_o=I_{o\_min}$ to I_{o_max}	All			±0.2	%
Line Regulation	V_{in}=low line to high line	All			±0.2	%
Temperature Coefficient	T_C=-40°C to 100°C	All			±0.03	%/°C

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Ripple and Noise						
Peak-to-Peak	5Hz to 20MHz bandwidth, Full load 10uF tantalum and 1.0uF ceramic capacitors	Vo= 3.3&5.0V Vo=12&15V Vo=24V			100 150 240	mV
RMS	5Hz to 20MHz bandwidth, Full load, 10uF solid tantalum and 1.0uF ceramic capacitors	Vo= 3.3&5.0V Vo=12&15V Vo=24V			40 60 100	mV
Operating Output Current Range		24S33 24S05 24S12 24S15 24S24 48S33 48S05 48S12 48S15 48S24	0 0 0 0 0 0 0 0 0 0		20 20 8.3 6.7 4.17 20 20 8.3 6.7 4.17	A
Output DC Current Limit Inception	Output Voltage=90% Nominal Output Voltage	All	110		140	%
Maximum Output Capacitance	Full load (resistive)	24S33 24S05 24S12 24S15 24S24 48S33 48S05 48S12 48S15 48S24	0 0 0 0 0 0 0 0 0 0		20000 20000 8300 6700 4170 20000 20000 8300 6700 4170	uF

DYNAMIC CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Current Transient						
Step Change in Output Current	75% to 100% of I_{o_max}	All			±5	%
Setting Time (within 1% Vout nominal)	d_i/d_t=0.1A/us	All			500	us
Turn-On Delay and Rise Time						
Turn-On Delay Time, From On/Off Control	$V_{on/off}$ to 10%V_{o_set}	All		7		ms
Turn-On Delay Time, From Input	V_{in_min} to 10%V_{o_set}	$24V_{in}$		4		ms
		$48V_{in}$		5		
Output Voltage Rise Time	10%V_{o_set} to 90%V_{o_set}	All		2		ms

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
100% Load	V_{in}=Nominal V_{in}	24S33		83		%
		24S05		84		
		24S12		87		
		24S15		88		
		24S24		87		
		48S33		82		
		48S05		86		
		48S12		89		
		48S15		89		
		48S24		88		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Isolation Voltage	1 minute; input/output, input/case, output/case	All			1500	V_{dc}
Isolation Resistance		All	10			MΩ
Isolation Capacitance		All		1000		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		500		KHz
On/Off Control, Positive Remote On/Off logic						
Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		0.8	V
Logic High (Module On)	$V_{on/off}$ at $I_{on/off}$=0.0uA	All	Open Circuit		75	V
On/Off Control, Negative Remote On/Off logic						
Logic High (Module Off)	$V_{on/off}$ at $I_{on/off}$=0.0uA	All	Open Circuit		75	V
Logic Low (Module On)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		0.8	V
Off Converter Input Current	Shutdown input idle current	All			10	mA
Output Voltage Trim Range	P_{out}=max rated power	All	-10		+10	%
Output Over Voltage Protection		All	115	125	140	%
Over-Temperature Protection	Shutdown Case Temperature	All		100		°C
	Restart threshold Case Temperature	All		70		°C

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	I_o=100% of I_{o_max}; T_a=25°C per MIL-HDBK-217F	All		900		K hours
Weight		All		95		grams

5. Main Features and Functions

5.1 Operating Temperature Range

The CHB100 series converters can be operated within a wide case temperature range of -40°C to 100°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 half brick models is influenced by usual factors, such as:

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

5.2 Output Voltage Adjustment

Section 6.8 describes in detail how to trim the output voltage with respect to its set point. The output voltage on all models is adjustable within the range of +10% to -10%.

5.3 Over Current 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 output voltage of converter will be going down into current limit and power fold-back protection.

5.4 Output Over Voltage Protection

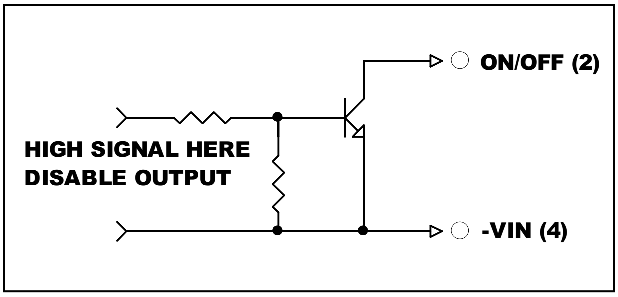
The output over voltage protection consists of circuitry that internally limits the output voltage. If more accurate output over voltage protection is required then an external circuit can be used via the remote on/off pin.

5.6 Remote On/Off

The CHB100 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 (open circuit). Setting the pin low (0 to <0.8Vdc) 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 (open circuit). The converter turns on if the on/off pin input is low (0 to <0.8Vdc). Note that the converter is off by default.

5.7 UVLO (Under Voltage Lock Out)

Input under voltage lockout is standard on the CHB100 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.



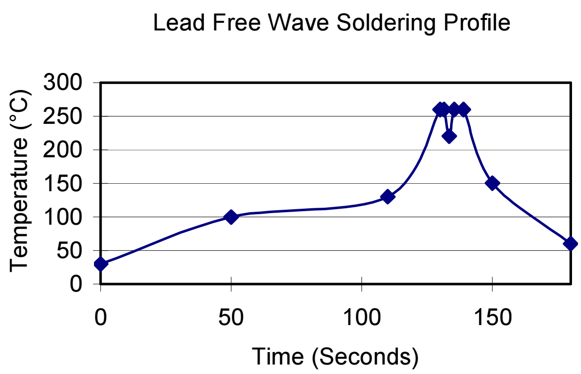
5.8 Over Temperature Protection

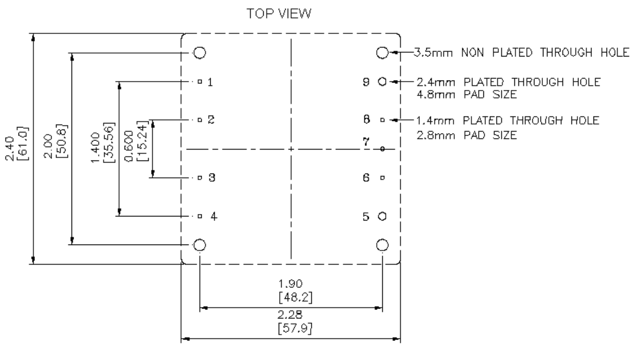
These modules have an over temperature protection circuit to safeguard against thermal damage. The module shuts down and latches off when the maximum case reference temperature is exceeded. The module will restart when the case temperature falls below restart threshold.

6. Applications

6.1 Recommended 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 soldering profile and PCB layout are shown below.





6.2 Convection Requirements for Cooling

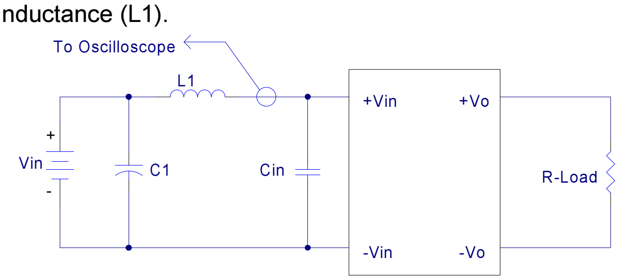
To predict the approximate cooling needed for the half brick module, refer to the power derating curves in section 6.4. These derating curves are approximations of the ambient temperatures and airflows required to keep the power module temperature below its maximum rating. Once the module is assembled in the actual system, the module's temperature should be monitored to ensure it does not exceed 100°C as measured at the center of the top of the case (thus verifying proper cooling).

6.3 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 6.4. The power output of the module should not be allowed to exceed rated power (V_{o_set} x I_{o_max}).

6.4 Input Capacitance at the Power Module

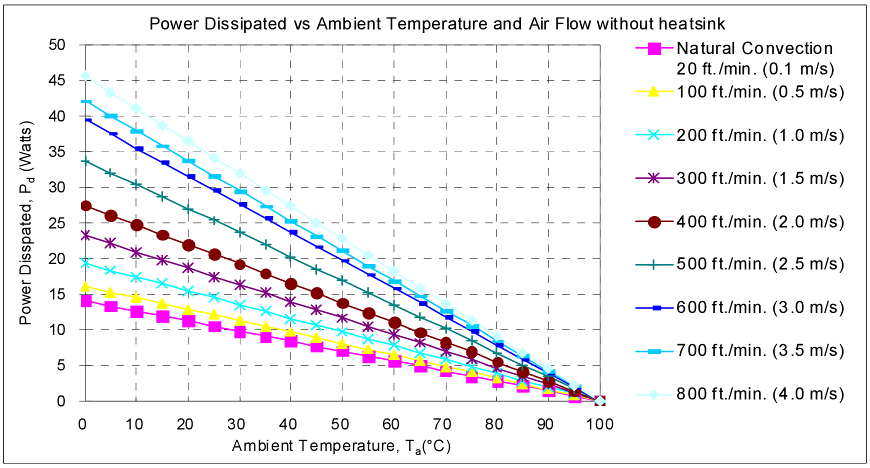
The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (Cin) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen 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: Short
C1: NC
Cin: NC
Input Reflected-Ripple Test Setup

6.5 Power Derating

The operating case temperature range of CHB100 series is -40°C to +100°C. When operating the CHB100 series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 100°C.



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

Example:

What is the minimum airflow necessary for a CHB100-48S12 operating at nominal line voltage, an output current of 8.3A, and a maximum ambient temperature of 50°C

Solution:

Given:

Vin=48Vdc, Vo=12Vdc, Io=8.3A

Determine Power dissipation (P_d):

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

$P_d = 12\times8.3\times(1-0.89)/0.89 = 12.31$Watts

Determine airflow:

Given: P_d =12.31W and T_a=50°C

Check above Power Derating curve:

Minimum airflow= 400 ft./min.

Verify:

The maximum temperature rise

ΔT = Pd×Rca=12.31×3.64=44.81℃

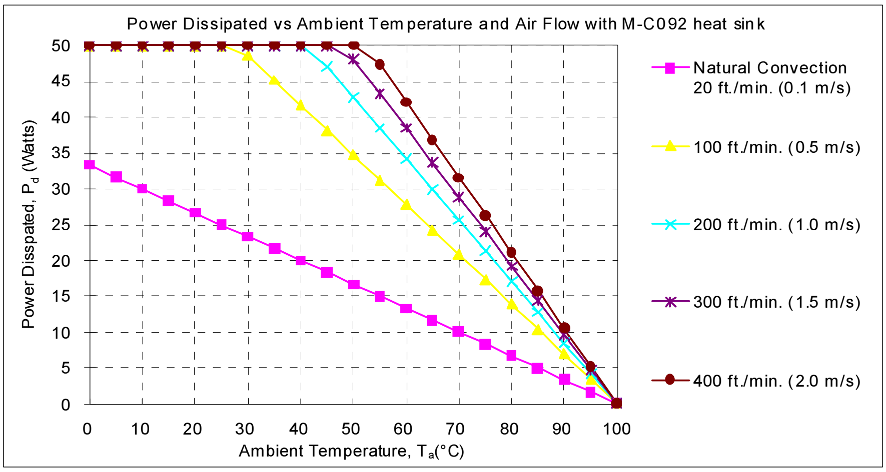
The maximum case temperature

Tc=Ta+ΔT=94.81℃ <100℃

Where:

The Rca is thermal resistance from case to ambience.

The Ta is ambient temperature and the Tc is case temperature.



AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	3°C/W
100 ft./min. (0.5m/s)	1.44°C/W
200 ft./min. (1.0m/s)	1.17°C/W
300 ft./min. (1.5m/s)	1.04°C/W
400 ft./min. (2.0m/s)	0.95°C/W

Example with heatsink HBT254 (M-C092):
What is the minimum airflow necessary for a CHB100-48S12 operating at nominal line voltage, an output current of 8.3A, and a maximum ambient temperature of 55℃

Solution:
Given:
Vin=48V_{dc}, Vo=12V_{dc}, Io=8.3A

Determine Power dissipation (Pd):
$P_d=P_i-P_o=P_o(1-\eta)/\eta$
P_d=12×8.3×(1-0.89)/0.89=12.31Watts

Determine airflow:
Given: P_d=12.31W and T_a=55℃

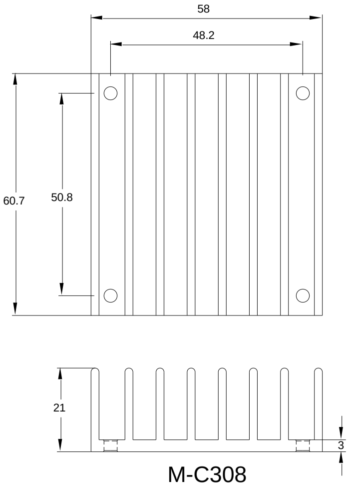
Check above Power de-rating curve:
P_d<15W, Natural Convection

Verify: Maximum temperature rise is △T = Pd × Rca=12.31×3=36.93℃

Maximum case temperature is $T_c=T_a+\Delta T$=91.93℃ <100℃

Where: The Rca is thermal resistance from case to ambient environment.
T_a is ambient temperature and T_c is case temperature.

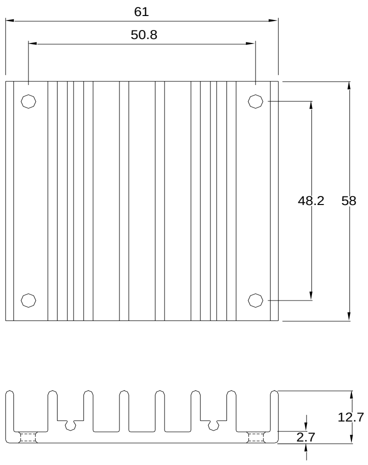
6.6 Half Brick Heat Sinks:



M-C308

HBL210 (M-C308) G6620400201
Longitudinal Heat Sink

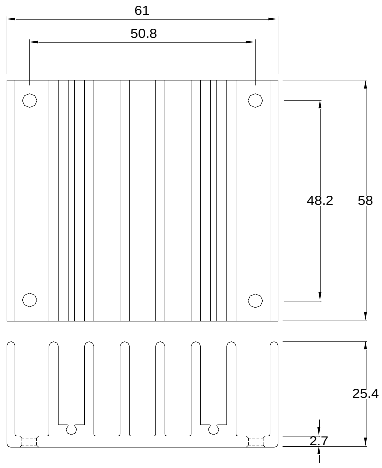
Rca:
3.90°C/W (typ.), natural convection
1.74°C/W (typ.), at 100LFM
1.33°C/W (typ.), at 200LFM
1.12°C/W (typ.), at 300LFM
0.97°C/W (typ.), at 400LFM



M-C091

HBT127 (M-C091) G6610120402
Transverse Heat Sink

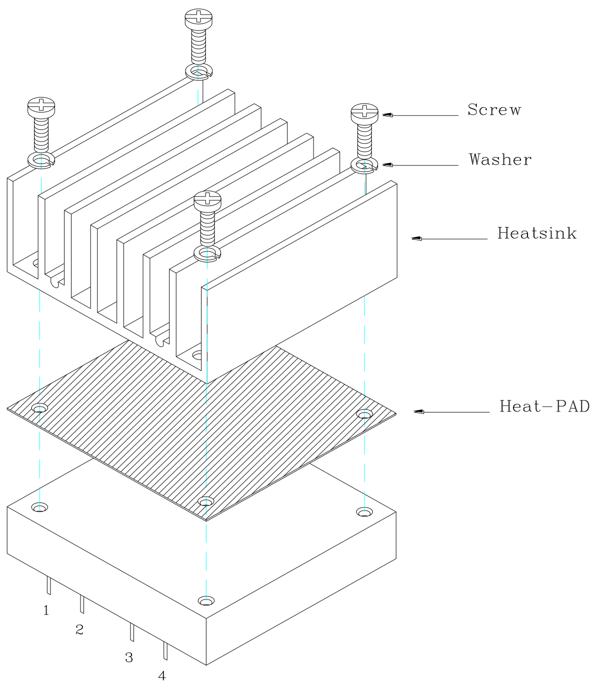
Rca:
4.70°C/W (typ.), natural convection
2.89°C/W (typ.), at 100LFM
2.30°C/W (typ.), at 200LFM
1.88°C/W (typ.), at 300LFM
1.59°C/W (typ.), at 400LFM



M-C092

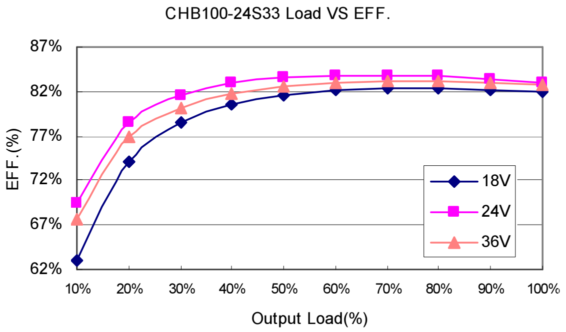
HBT254 (M-C092) G6610130402
Transverse Heat Sink

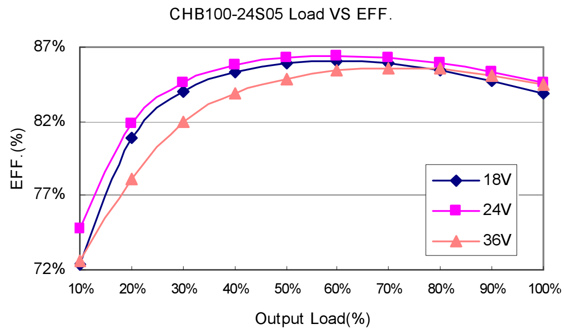
Rca:
3.00°C/W (typ.), natural convection
1.44°C/W (typ.), at 100LFM
1.17°C/W (typ.), at 200LFM
1.04°C/W (typ.), at 300LFM
0.95°C/W (typ.), at 400LFM

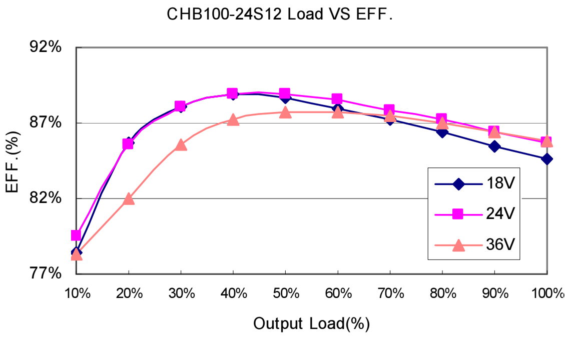


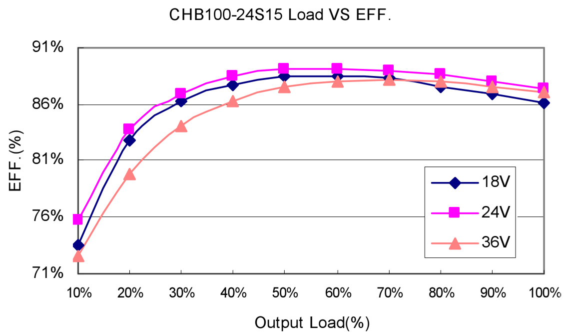
THERMAL PAD PH01: SZ 56.9*60*0.25 mm (G6135041091)
SCREW K308W: SMP+SW M3*8L (G75A1300322)

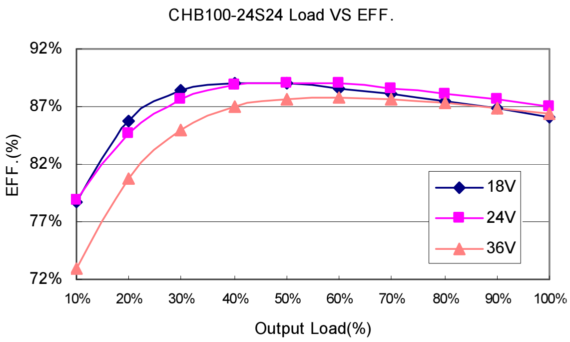
6.7 Efficiency VS. Load

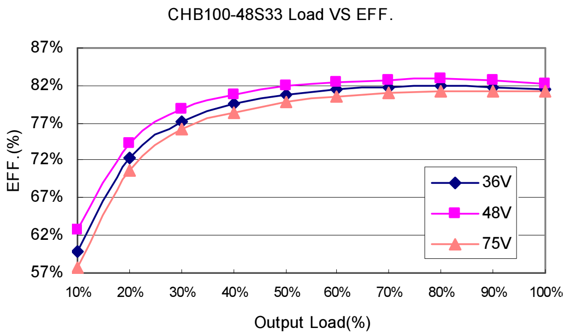


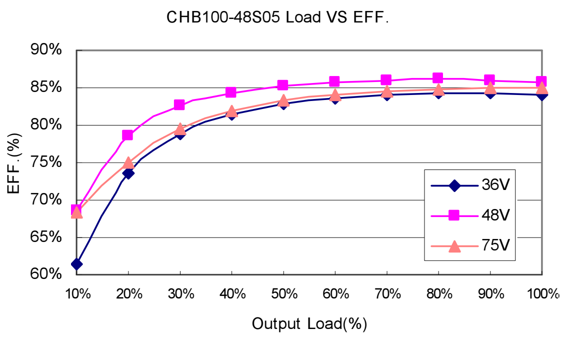


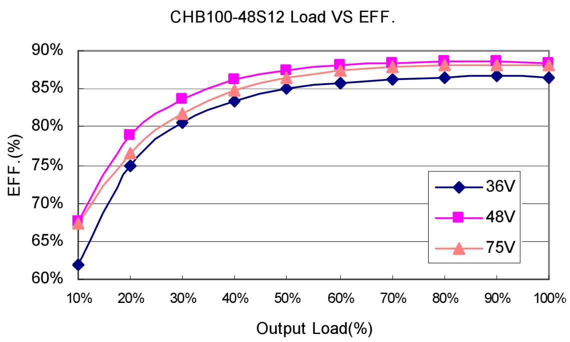


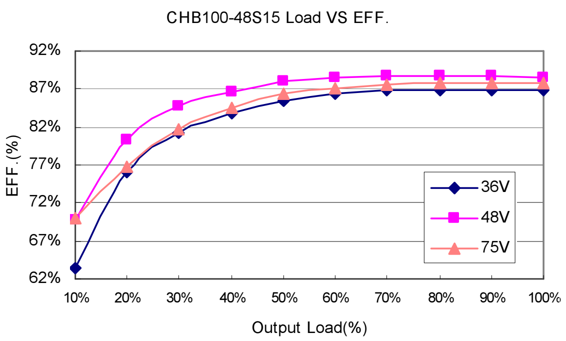


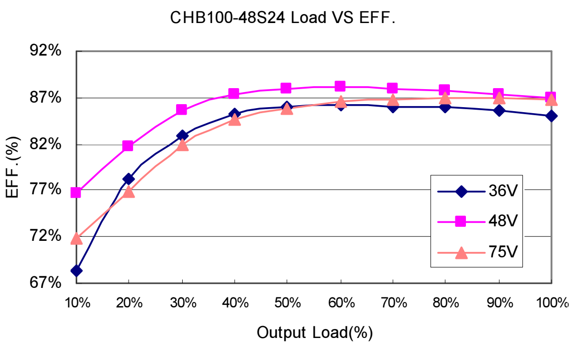





CHB100-48S05 Load VS EFF.
90%
85%
80%
75%
70%
65%
60%
EFF.(%)
36V
48V
75V
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Output Load(%)


CHB100-48S12 Load VS EFF.
90%
85%
80%
75%
70%
65%
60%
EFF.(%)
36V
48V
75V
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Output Load(%)


CHB100-48S15 Load VS EFF.
92%
87%
82%
77%
72%
67%
62%
EFF.(%)
36V
48V
75V
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Output Load(%)


CHB100-48S24 Load VS EFF.
92%
87%
82%
77%
72%
67%
EFF.(%)
36V
48V
75V
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Output Load(%)

6.8 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:

$$\eta = \frac{Vo \times Io}{Vin \times Iin} \times 100\%$$

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

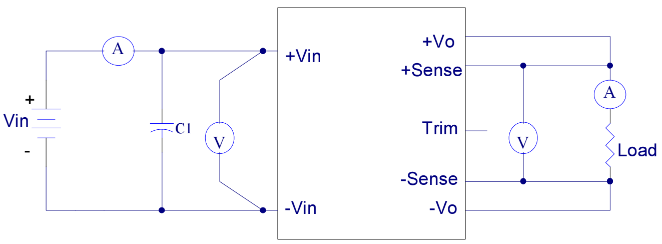
V_{NL} is the output voltage at no load

The value of line regulation is defined as:

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

Where:

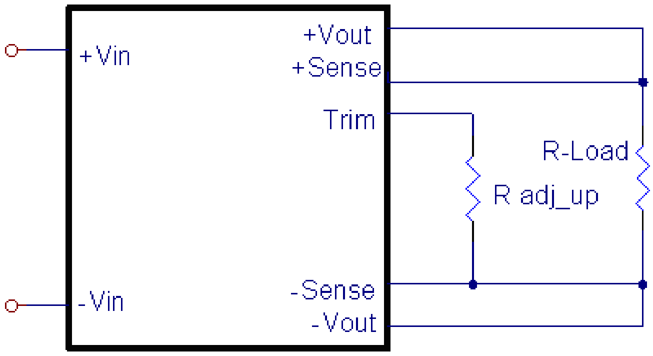
V_{HL} is the output voltage of maximum input voltage at full load. V_{LL} is the output voltage of minimum input voltage at full load.



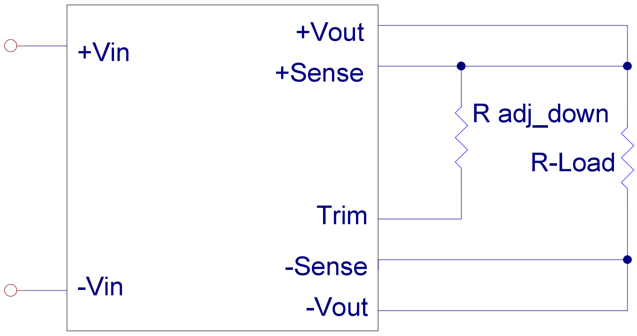
CHB100W Series Test Setup

6.9 Output Voltage Adjustment

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



Trim-up Voltage Setup



Trim-down Voltage Setup

Model No.	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	V_r (V)	V_f (V)
24S33	3	12	4.3	1.24	0.46
48S33	3	12	5.1	1.24	0.46
XXS05	2.32	3.3	NC	2.5	0
XXS12	9.1	51	5.1	2.5	0.46
XXS15	12	56	8.25	2.5	0.46
XXS24	20	100	7.5	2.5	0.46

Table of trim resistor values

The value of R_{adj_up} defined as:

For 5V output module

$$R_{adj\_up} = \left(\frac{R_1 V_r}{Vo - V_{o\_nom}}\right) - R_2 \ (K\Omega)$$

For other output module

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

Where:

R_{adj_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 and V_r are internal components and are defined in the table of trim resistor values

For example, to trim-up the output voltage of 5V module (CHB100-48S05) by 8% to 5.4V, R_{adj_up} is calculated as follows:

Vo – Vo_nom = 5.4 – 5.0 = 0.4V
R1 = 2.32 KΩ, R2 = 3.3 KΩ,
Vr= 2.5 V

$$R_{adj\_up} = \frac{5.8}{0.4} - 3.3 = 11.2 \ (K\Omega)$$

The value of R_{adj_down} defined as:

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

Where:

R_{adj_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 V_r are internal components.

For example: to trim-down the output voltage of 5V module (CHB100-48S05) by 8% to 4.6V, R_{adj_down} is calculated as follows:

$V_{o\_nom} - V_o$ = 5.0 – 4.6 = 0.4 V
R1 = 2.32 KΩ, R2 = 3.3 KΩ, V_r = 2.5 V

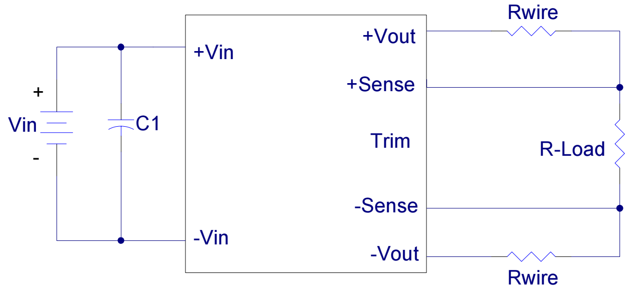
$$R_{adj\_down} = \frac{2.32 \times (4.6 - 2.5)}{0.4} - 3.3 = 8.88 \ (K\Omega)$$

6.10 Output Remote Sensing

The CHB100 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 CHB100 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:

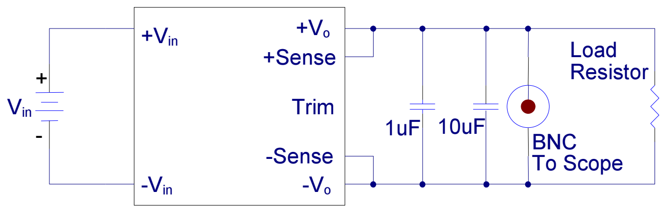
$[(+V_{out}) - (-V_{out})] - [(+Sense) - (-Sense)] \leqq 10\%$ of $V_{o\_nominal}$

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.
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.

6.11 Output Ripple and Noise



Output ripple and noise is measured with 1.0uF ceramic and 10uF solid tantalum capacitors across the output.

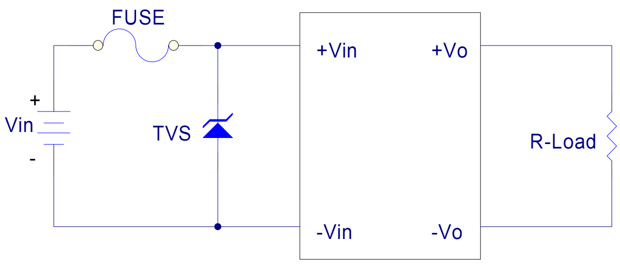
6.12 Output Capacitance

The CHB100 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. 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.

7. Safety & EMC

7.1 Input Fusing and Safety Considerations

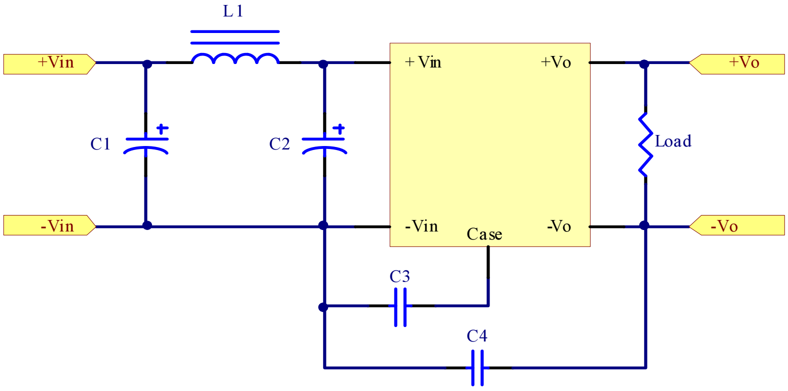
The CHB100 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended use of fast acting type fuse 5A for 24S33, 48SXX models, 10A for 24SXX models and 3A for 48S33 models. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).



7.2 EMC Considerations

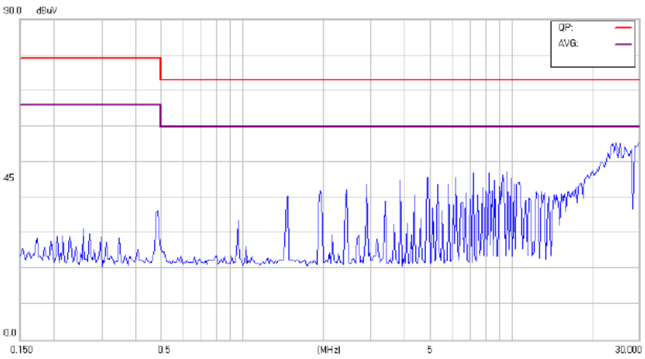
Suggested Circuits for Conducted EMI Class A & Class B

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

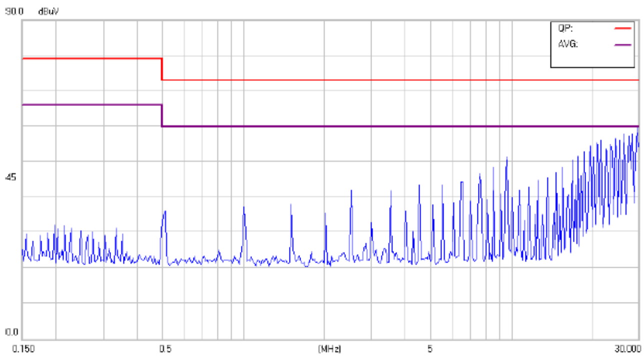


Model No.	C1	C2	C3	C4	L1
CHB100-24S33	220uF/50V	220uF/50V	2200pF	NC	3.4uH
CHB100-24S05	220uF/50V	220uF/50V	2200pF	NC	3.4uH
CHB100-24S12	220uF/50V	220uF/50V	2200pF	NC	3.4uH
CHB100-24S15	220uF/50V	220uF/50V	2200pF	NC	3.4uH
CHB100-24S24	220uF/50V	220uF/50V	2200pF	NC	3.4uH
CHB100-48S33	47uF/100V	47uF/100V	1000pF	NC	3.4uH
CHB100-48S05	47uF/100V	47uF/100V	1000pF	NC	3.4uH
CHB100-48S12	47uF/100V	47uF/100V	1000pF	NC	3.4uH
CHB100-48S15	47uF/100V	47uF/100V	1000pF	NC	3.4uH
CHB100-48S24	47uF/100V	47uF/100V	1000pF	NC	3.4uH

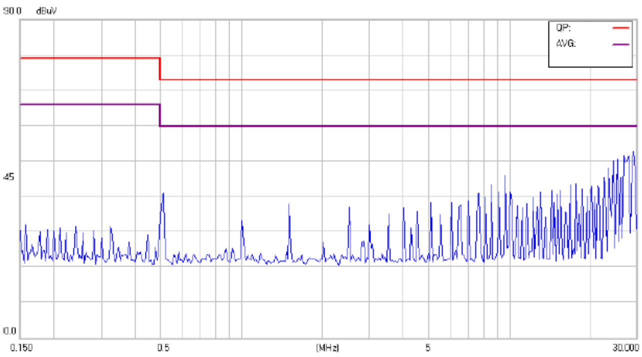
Note: C1, C2 is aluminum capacitors, C3, C4 is ceramic capacitors.



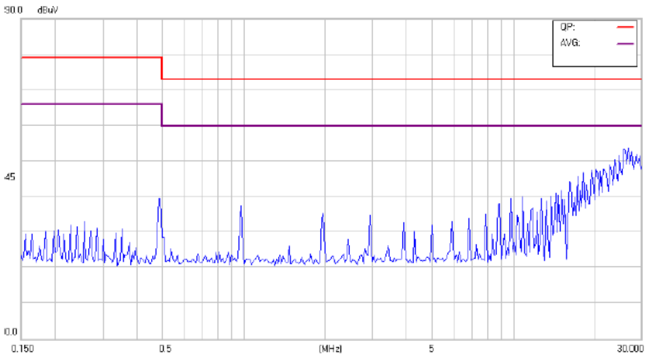
Conducted Class A of CHB100-24S33



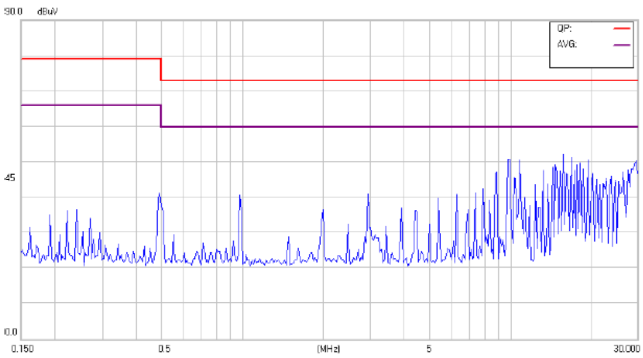
Conducted Class A of CHB100-24S05



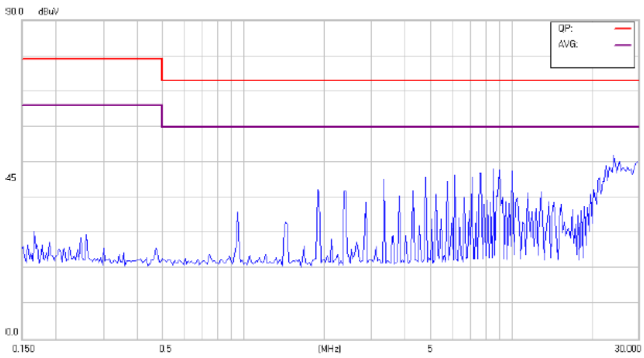
Conducted Class A of CHB100-24S12



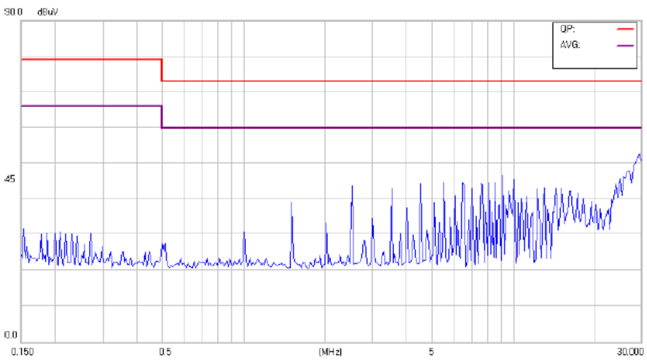
Conducted Class A of CHB100-24S15



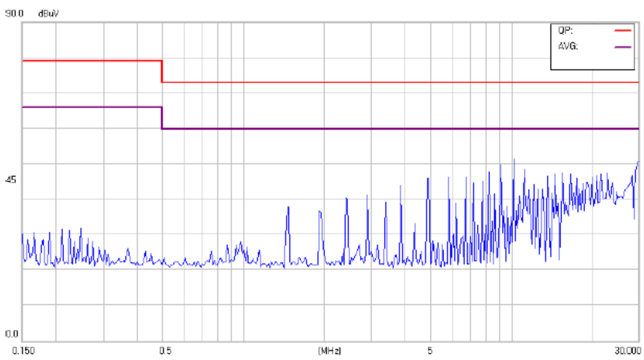
Conducted Class A of CHB100-24S24



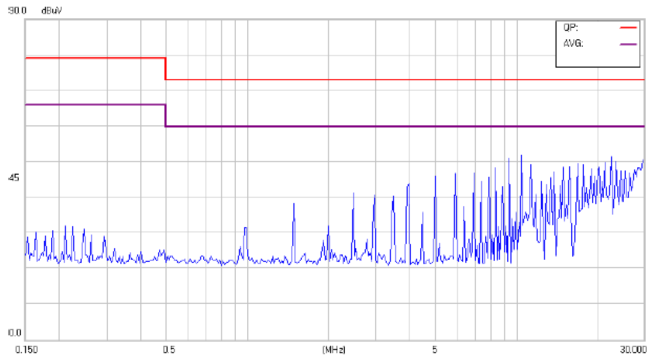
Conducted Class A of CHB100-48S33



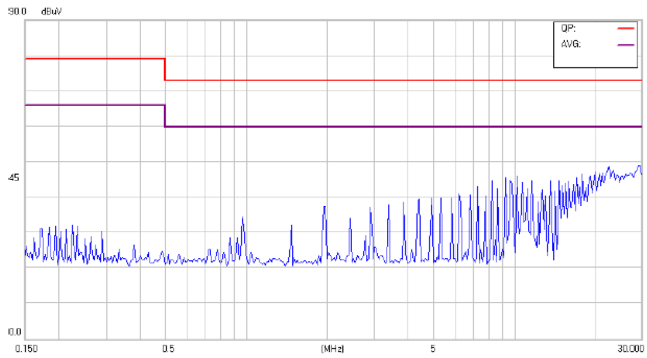
Conducted Class A of CHB100-48S05



Conducted Class A of CHB100-48S12

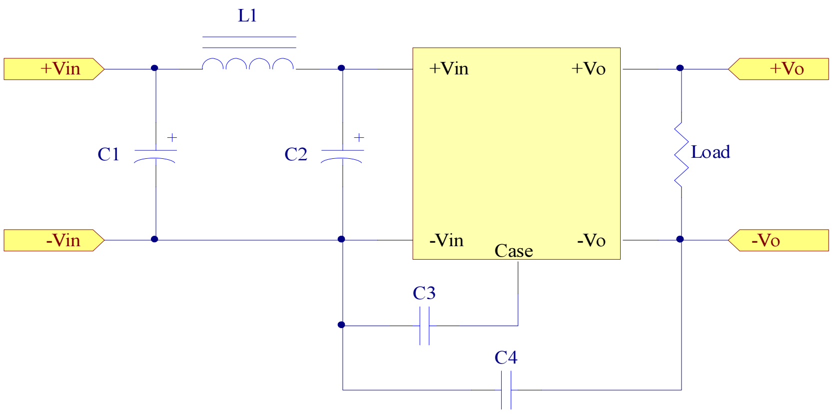


Conducted Class A of CHB100-48S15



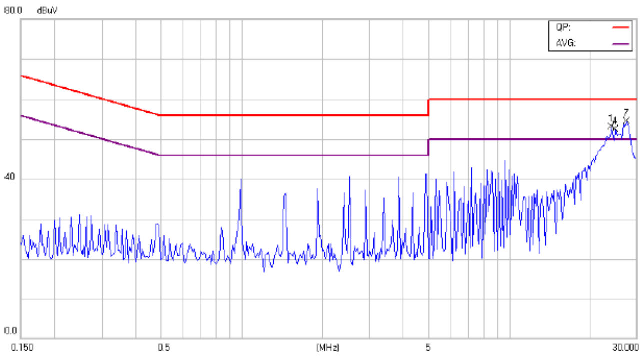
Conducted Class A of CHB100-48S24

(2) EMI and conducted noise meet EN55032 Class B specifications:

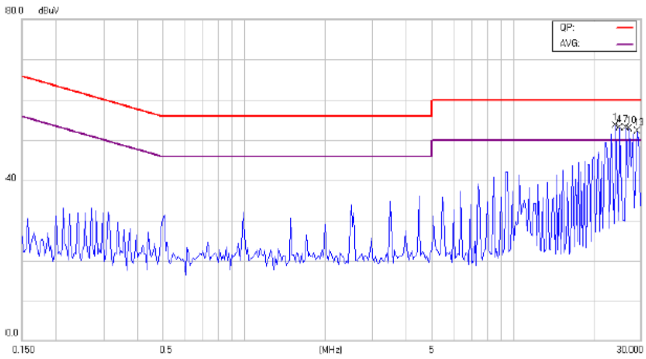


Model No.	C1	C2	C3	C4	L1
CHB100-24S33	220uF/63V	220uF/63V	1500pF	1500pF	17.3uH
CHB100-24S05	220uF/63V	220uF/63V	1500pF	1500pF	17.3uH
CHB100-24S12	220uF/63V	220uF/63V	1500pF	1500pF	17.3uH
CHB100-24S15	220uF/63V	220uF/63V	1500pF	1500pF	17.3uH
CHB100-24S24	220uF/63V	220uF/63V	1500pF	1500pF	17.3uH
CHB100-48S33	47uF/100V	47uF/100V	1500pF	1500pF	3.4uH
CHB100-48S05	47uF/100V	47uF/100V	1500pF	1500pF	3.4uH
CHB100-48S12	47uF/100V	47uF/100V	1500pF	1500pF	3.4uH
CHB100-48S15	47uF/100V	47uF/100V	1500pF	1500pF	3.4uH
CHB100-48S24	47uF/100V	47uF/100V	1500pF	1500pF	3.4uH

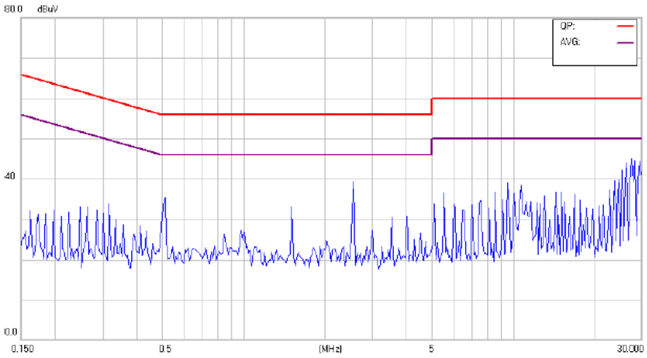
Note: C1, C2 is aluminum capacitors, C3, C4 is ceramic capacitors.



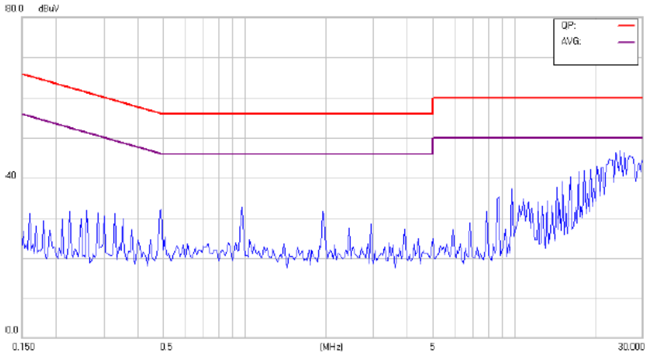
Conducted Class B of CHB100-24S33



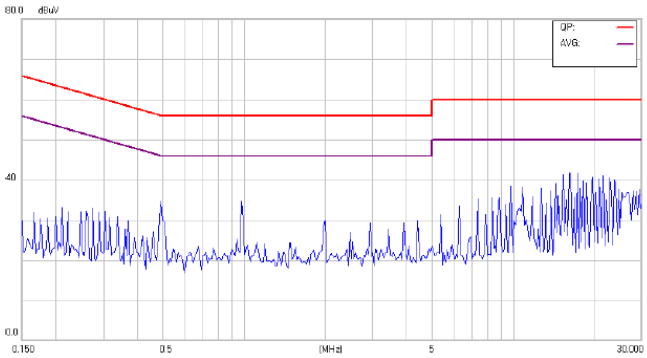
Conducted Class B of CHB100-24S05



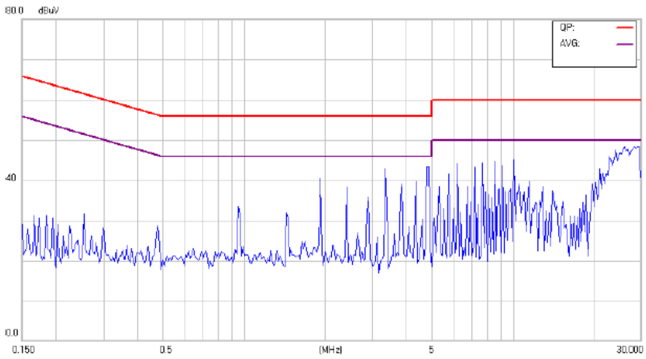
Conducted Class B of CHB100-24S12



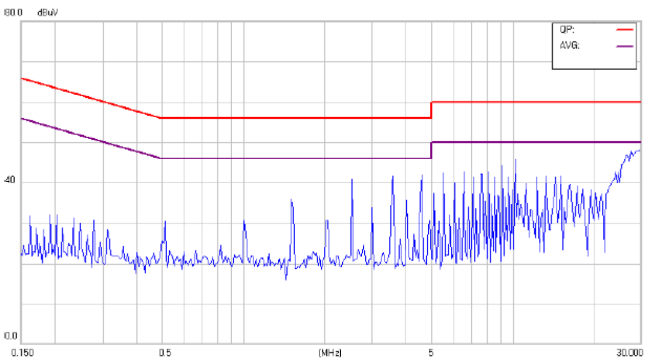
Conducted Class B of CHB100-24S15



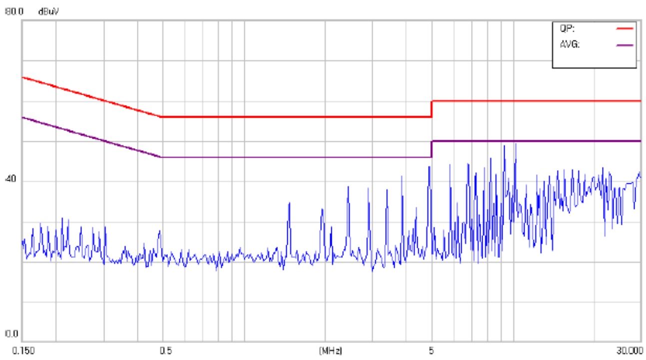
Conducted Class B of CHB100-24S24



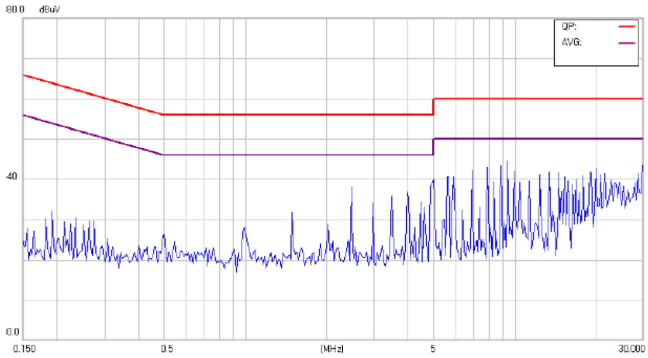
Conducted Class B of CHB100-48S33



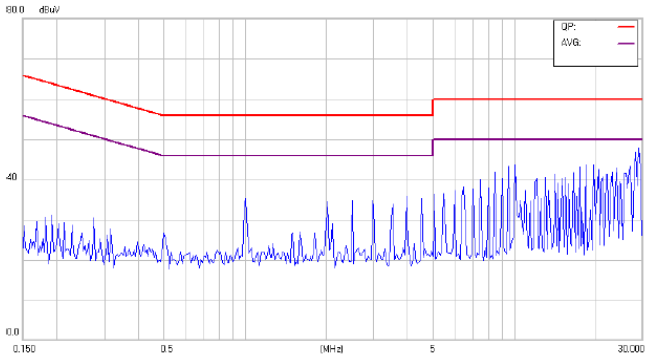
Conducted Class B of CHB100-48S05



Conducted Class B of CHB100-48S12



Conducted Class B of CHB100-48S15



Conducted Class B of CHB100-48S24

8. Part Number

Format: CHB100 – II X OO L Y

Parameter	Series	Nominal Input Voltage	Number of Outputs	Output Voltage	Remote ON/OFF Logic	Mounting Inserts
Symbol	CHB100	II	X	OO	L	Y (Option)
Value	CHB100	24: 24 Volts 48: 48 Volts	S: Single	33: 3.3 Volts 05: 05 Volts 12: 12 Volts 15: 15 Volts 24: 24 Volts	None: Positive N: Negative	-C: Clear Mounting Insert (3.2mm DIA.)

9. Mechanical Specifications

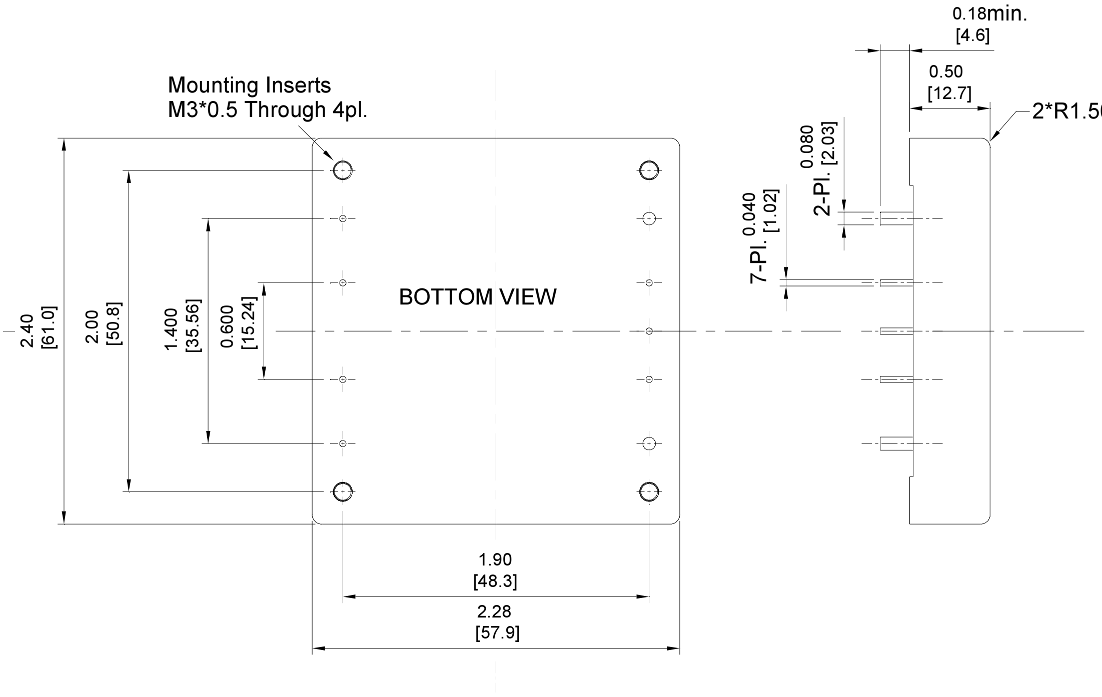
9.1 Mechanical Outline Diagrams

CASE HB

All Dimensions In Inches(mm)

Tolerances Inches: X.XX= ±0.02 , X.XXX= ±0.010

Millimeters: X.X= ±0.5 , X.XX=±0.25



Pin	Function
1	+V Input
2	On/Off
3	CASE
4	-V Input
5	-V Output
6	-Sense
7	Trim
8	+Sense
9	+V Output

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