ISOLATED DC-DC CONVERTER
CHB100-110S series
APPLICATION NOTE

Approved By:

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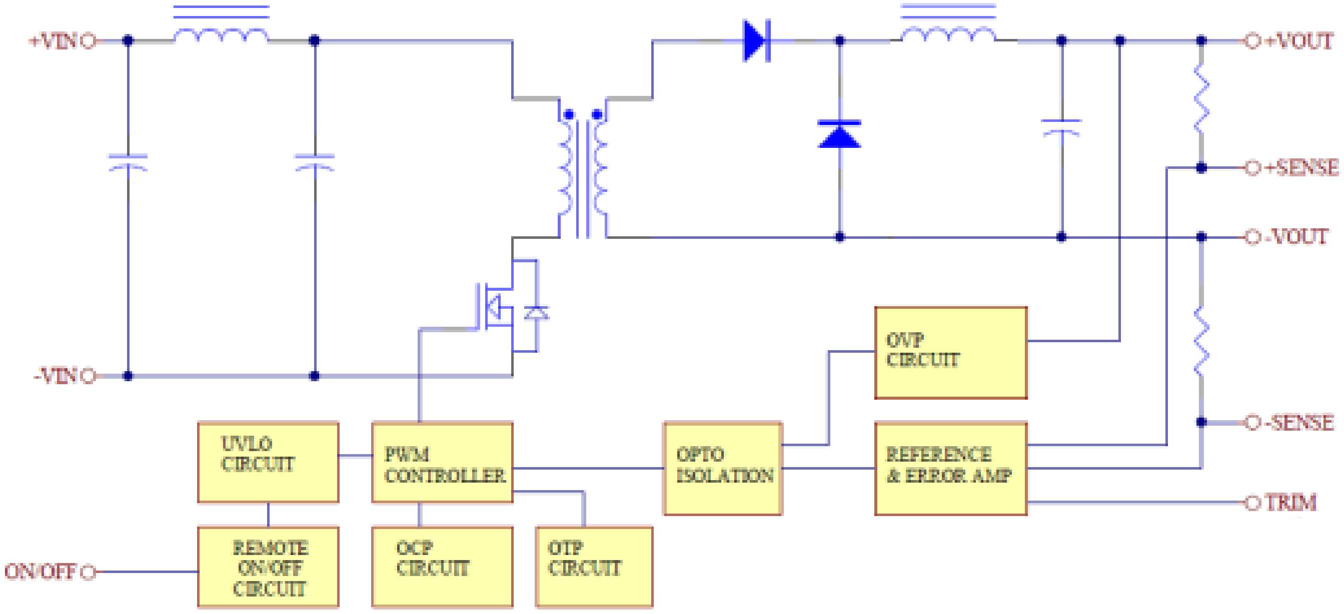
1. Introduction

The CHB100-110S series offers 100 watts of output power with high power density in an industry standard half-brick package. The CHB100-110S series is wide (3:1) input voltage range of 66-160VDC and provides a precisely regulated output. This series has features such as high efficiency, 3000Vrms 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 overvoltage and overtemperature 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, railway system, and mobile equipment applications.

2. DC-DC Converter Features

- 100W Isolated Output
- Efficiency to 89%
- Low No Load Input Power
- 3:1 Input Range
- Regulated Outputs
- Remote On/Off
- Over Temperature Protection
- Over Voltage/Current Protection
- Continuous Short Circuit Protection
- Half-Brick Size Meet Industrial Standard
- Meet EN50155 With External Circuit
- Shock & Vibration Meet EN50155 (EN61373)
- Fire & Smoke meet EN45545-2
- 3000m Operating Altitude
- Meet UL60950-1
- LVD Approval

3. Electrical Block Diagram



Electrical Block Diagram

4. Technical Specifications

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

ABSOLUTE MAXIMUM RATINGS

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Input Voltage						
Continuous		All	-0.3		160	V_{dc}
Transient	100ms	All			180	V_{dc}
Operating Case Temperature		All	-40		100	°C
Storage Temperature		All	-55		105	°C
Isolation Voltage	1 minute; input/output	All	3000			V_{rms}
	1 minute; input/case	All	1500			
	1 minute; output/case	All	500			

INPUT CHARACTERISTICS

PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Operating Input Voltage		All	66	110	160	V_{dc}
Input Undervoltage Lockout						
Turn-On Voltage Threshold		All	60	62	64	V_{dc}
Turn-Off Voltage Threshold		All	54	56	58	V_{dc}
Lockout Hysteresis Voltage		All		6		V_{dc}
Maximum Input Current	100% Load, V_{in}=66V	All		1785		mA
No-Load Input Current	V_{in}=Nominal	Vo=12V		3		mA
		Vo=15V		3		
		Vo=24V		3		
		Vo=48V		5		
Inrush Current (I^2t)		All			0.1	A^2s
Input Reflected Ripple Current	P-P thru 12uH inductor, 5Hz to 20MHz	All		50		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=12 V	11.88	12	12.12	V_{dc}
		Vo=15 V	14.85	15	15.15	
		Vo=24 V	23.76	24	24.24	
		Vo=48 V	47.52	48	48.48	
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	Tc=-40°C to 100°C	All			±0.03	%/°C
Output Voltage Ripple and Noise	5Hz to 20MHz bandwidth					
Peak-to-Peak	Full load, 10uF Tantalum capacitor and 1.0uF ceramic capacitors	Vo=12V			150	mV
		Vo=15V			150	
		Vo=24V			240	
	Full load, 47uF Aluminum capacitor and 1.0uF ceramic capacitors	Vo=48V			480	

PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
RMS	Full load, 10uF Tantalum capacitor and 1.0uF ceramic capacitors	Vo=12V			60	mV
		Vo=15V			60	
		Vo=24V			100	
	Full load, 47uF Aluminum capacitor and 1.0uF ceramic capacitors	Vo=48V			200	
Operating Output Current Range		Vo=12V	0		8.3	A
		Vo=15V	0		6.7	
		Vo=24V	0		4.17	
		Vo=48V	0		2.08	
Output DC Current Limit Inception	Output Voltage=90% Nominal Output Voltage	All	110	130	160	%
Maximum Output Capacitance	Full load (resistive)	Vo=12V	0		8300	uF
		Vo=15V	0		4170	
		Vo=24V	0		4170	
		Vo=48V	0		1500	

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		10		ms
Turn-On Delay Time, From Input	V_{in_min} to 10%V_{o_set}	All		25		ms
Output Voltage Rise Time	10%V_{o_set} to 90%$_{Vo\_set}$	All		15		ms

EFFICIENCY

PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
100% Load	V_{in}=Nominal V_{in}, Tc=25°C	Vo=12V		86.5		%
		Vo=15V		87.5		
		Vo=24V		87.5		
		Vo=48V		89		

ISOLATION CHARACTERISTICS

PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Isolation Voltage	1 minute; input/output	All			3000	V_{rms}
	1 minute; input/case	All			1500	
	1 minute; output/case	All			500	
Isolation Resistance		All	1000			MΩ
Isolation Capacitance		All		500		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		250		KHz
On/Off Control, Positive Remote On/Off logic						
Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		1.8	V
Logic High (Module On)	$V_{on/off}$ at $I_{on/off}$=0.0uA	All	Open Circuit			V
On/Off Current (for both remote on/off logic)	$I_{on/off}$ at $V_{on/off}$=0.0V	All		0.3	1	mA
Leakage Current (for both remote on/off logic)	Logic High, $V_{on/off}$=15V	All			30	uA
Off Converter Input Current	Shutdown input idle current	All		1.5	5	mA
Output Voltage Trim Range	P_{out}=max rated power	All	-10		+10	% Vo, nom
Output Over Voltage Protection		All	115	125	140	% Vo, nom
Over-Temperature Shutdown		All		105		°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, GB	All		830		K hours
Weight		All		95		grams
Case Material	Plastic, DAP					
Baseplate Material	Aluminum					
Potting Material	UL 94V-0					
Pin Material	Base: Copper Plating: Nickel with Matte Tin					
Shock/Vibration	Meet EN50155(EN61373)					
Environmental	Meet EN50155(EN60068-2-1)					
Humidity	95% RH max. Non Condensing					
Altitude	3000m Operating Altitude, 12000m Transport Altitude					
Safety	LVD Approval , Meet UL60950-1					
EMC (see Item 7.2)	Meet EN50155(EN50121-3-2) With External Filter					
EMI	EN55011 Class A					
ESD	EN61000-4-2 Air ±8KV Perf. Criteria A					
	EN61000-4-2 Contactr ±6KV Perf. Criteria A					
Radiated Immunity	EN61000-4-3 10V/m Per. Criteria A					
Fast Transient	EN61000-4-4 ±2KV Perf. Criteria A					
Surge	EN61000-4-5 ±1KV Perf. Criteria A					
Conducted Immunity	EN61000-4-6 10Vr.m.s Perf. Criteria A					

5. Main Features and Functions

5.1 Operating Temperature Range

The CHB100-110S 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 open 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 converter will go into hiccup mode protection.

5.4 Output Over Voltage Protection

The output overvoltage 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 CHB100-110S 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” versions. The converter turns on if the remote on/off pin is high (open circuit). Setting the pin low (0 to <1.8Vdc) 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).if the remote on/off pin is high (open circuit). The converter turns on if the on/off pin input is low (0 to <1.8Vdc). Note that the converter is off by default.

5.7 UVLO (Under Voltage Lock Out)

Input under voltage lockout is standard on the CHB100-110S 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

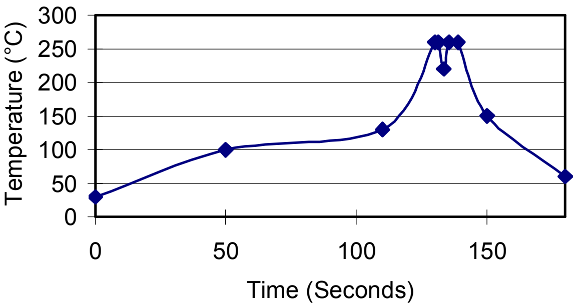
These modules have an over temperature protection circuit to safeguard against thermal damage. Shutdown occurs with the maximum case reference temperature is exceeded. The module will restart when the case temperature falls below over temperature shutdown threshold.

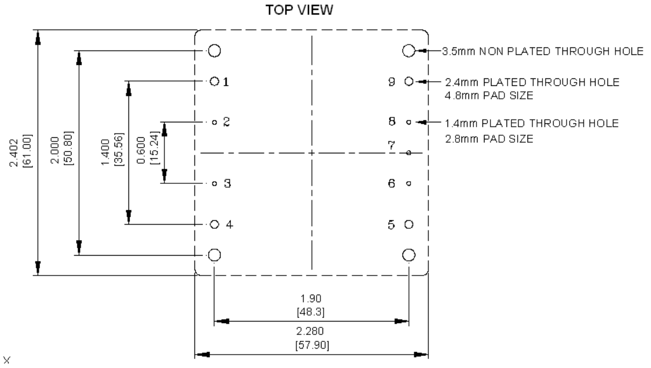
6. Applications

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.

Lead Free Wave Soldering Profile





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 Power Derating

The operating case temperature range of CHB100-110S series is -40°C to +100°C. When operating the CHB100-110S series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 100°C.

Example:

What is the minimum airflow necessary for a CHB100-110S12 operating at nominal line voltage, an output current of 8.3A, and a maximum ambient temperature of 40°C?

Solution:

Given:

V_{in}=110V_{dc}, Vo=12V_{dc}, I_o=8.3A

Determine Power dissipation (P_d):

Pd =Pi-Po=Po(1-η)/η

Pd =12V×8.3A×(1-0.85)/0.85=17.576Watts

Determine airflow:

Given: P_d =17.576W and T_a=40°C

Check *Power Derating* curve:

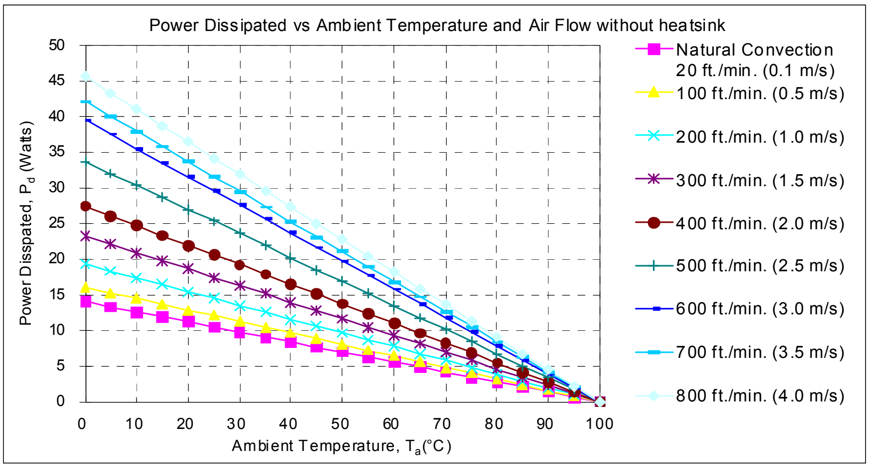
Minimum airflow= 500 ft./min.

Verify:

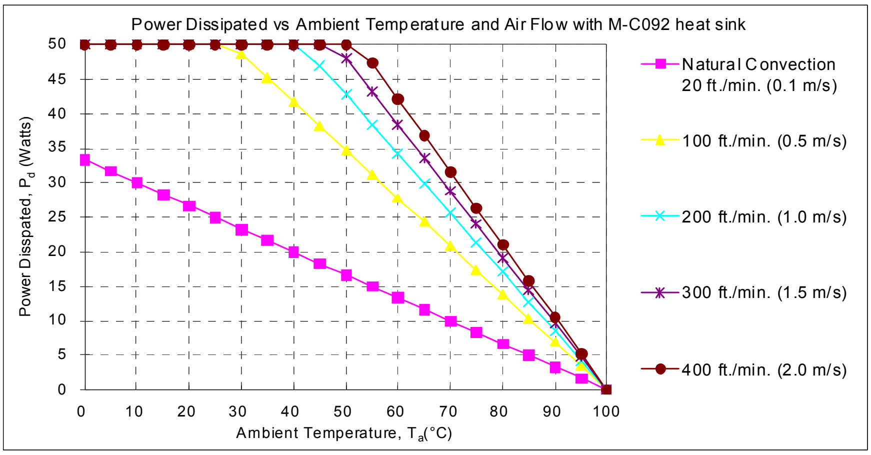
Maximum temperature rise is
$\Delta T = P_d \times R_{ca}$=17.576W×2.96=52.02°C.
Maximum case temperature is
$T_c=T_a+\Delta T$=92.02°C <100°C.

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)	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



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 CHB100-110S12 operating at nominal line voltage, an output current of 8.3A, and a maximum ambient temperature of 40℃?

Solution:

Given:

$Vin=110V_{dc}$, $Vo=24V_{dc}$, $Io=4.17A$

Determine Power dissipation (Pd):

$Pd=Pi-Po=Po(1-\eta)/\eta$

$Pd=24V\times4.17A\times(1-0.87)/0.87=14.95$Watts

Determine airflow:

Given: Pd=14.95W and Ta=40℃

Check above Power de-rating curve:

$P_d<20W$, Natural Convection

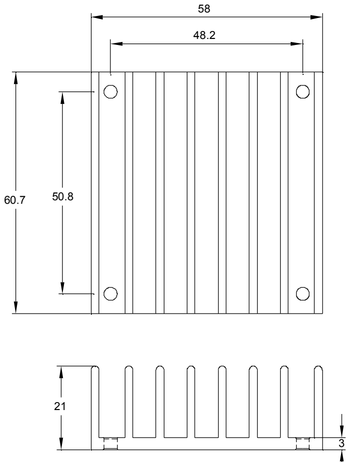
Verify:

Maximum temperature rise is
$\triangle T = P_d \times R_{ca}=14.95\times3=44.85$℃
Maximum case temperature is
$T_c=T_a+\triangle T=84.85$℃ <100℃

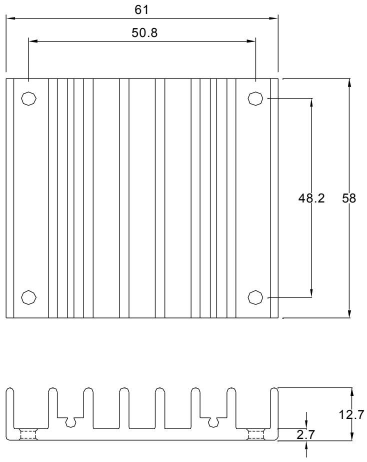
Where:

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

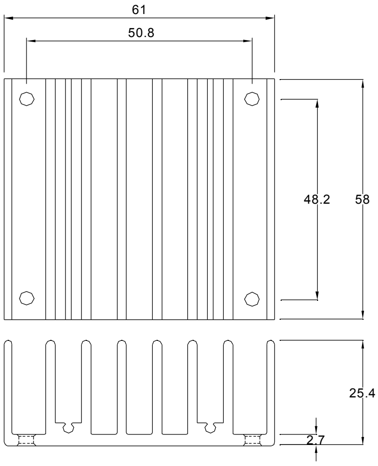
6.5 Half Brick Heat Sinks:



M-C308



M-C091



M-C092

HBL210 (M-C308) G6620400201
Longitudinal Heat Sink

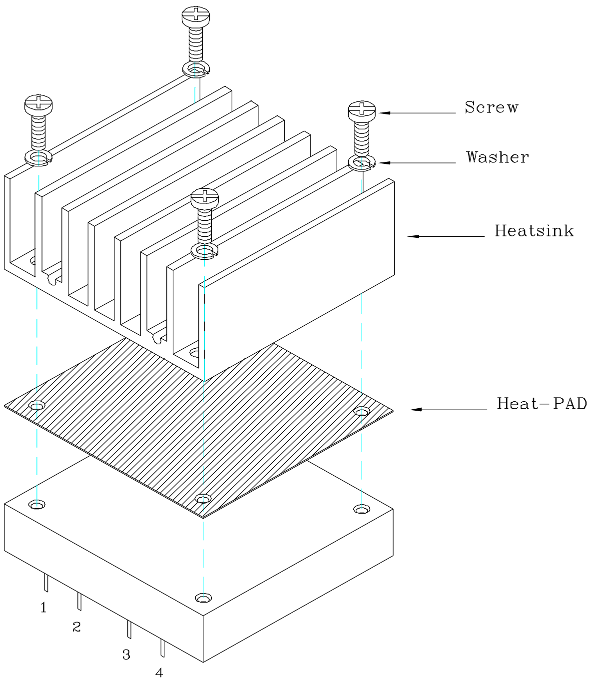
Rca:
3.90°C/W (typ.), natural convection
1.74°C/W (typ.), at 100LFM
1.33°C/W (typ.), at 200LFM
1.12°C/W (typ.), at 300LFM
0.97°C/W (typ.), at 400LFM

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

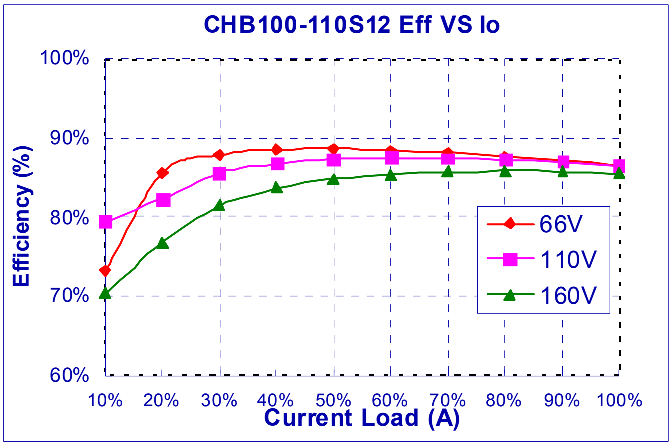
HBT254 (M-C092) G6610130402
Transverse Heat Sink

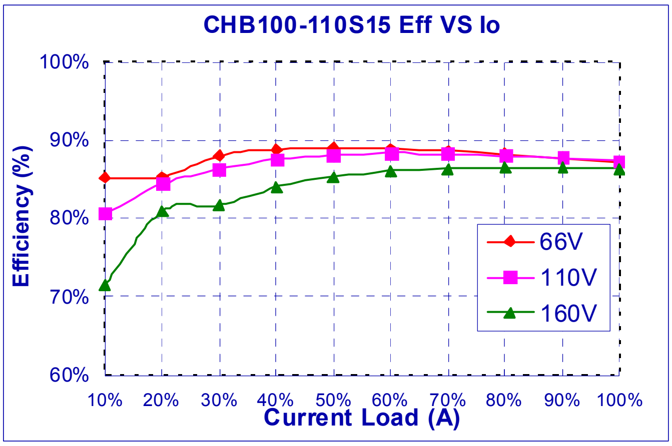
Rca:
3.00°C/W (typ.), natural convection
1.44°C/W (typ.), at 100LFM
1.17°C/W (typ.), at 200LFM
1.04°C/W (typ.), at 300LFM
0.95°C/W (typ.), at 400LFM

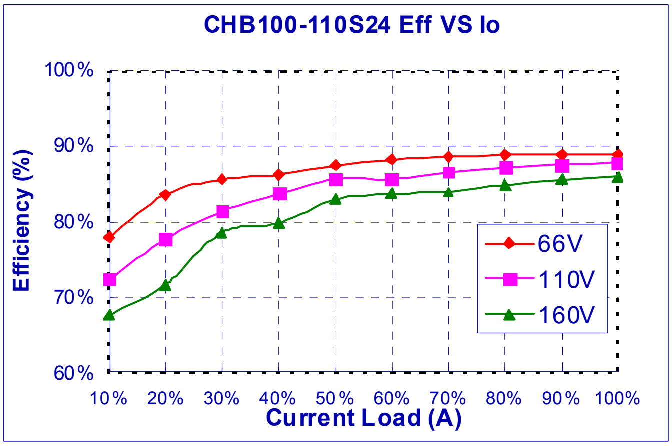


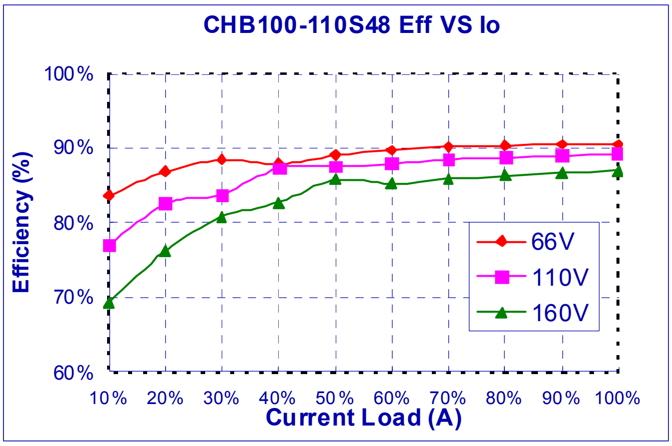
THERMAL PAD PH01: SZ 56.9*60*0.25 mm (G6135041091)
SCREW & Washer: M3*8L (G75A1300322) & WS3.2N (G75A47A0752)

6.6 Efficiency VS. Load









6.7 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:

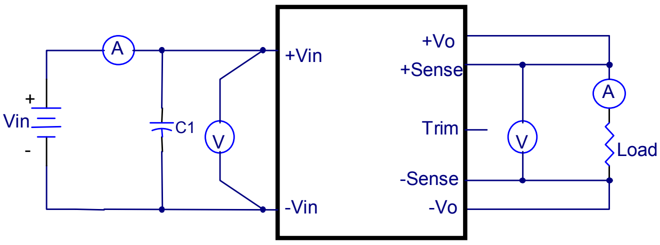
V_{FL} is the output voltage at full load.
V_{NL} is the output voltage at no load.

The value of line regulation is defined as:

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

Where:

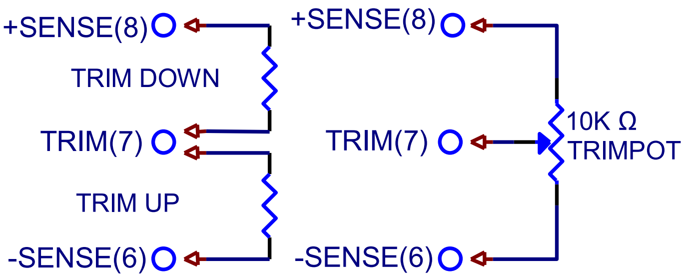
V_{HL} is the output voltage of maximum input voltage at full load. V_{LL} is the output voltage of minimum input voltage at full load.



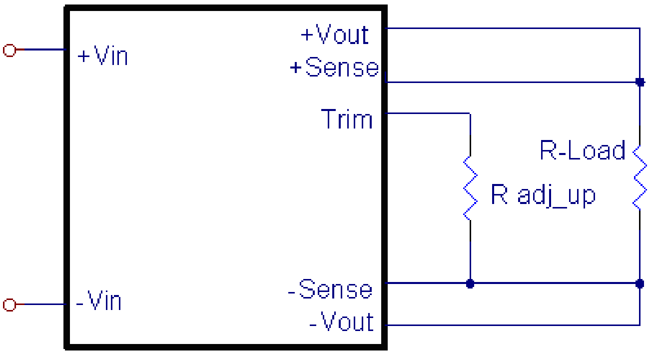
CHB100-110S Series Test Setup

6.8 Output Voltage Adjustment

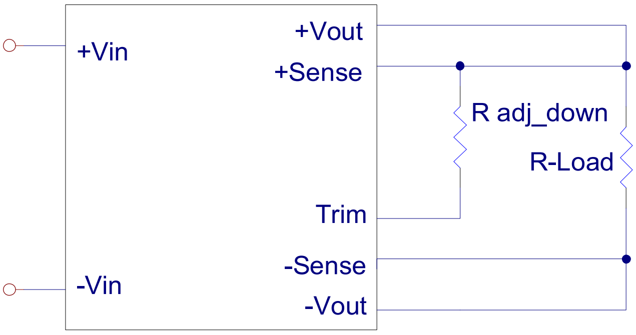
Output may be externally trimmed (±10%) with a fixed resistor or an external trimpot as shown (optional). Model specific formulas for calculating trim resistors are available upon request as a separate document.



In order to trim the voltage up or down, one needs to connect the trim resistor either between the trim pin and -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

V_{out} (V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	V_r (V)	V_f (V)
12V	9.1	51	5.1	2.5	0.46
15V	12	56	8.25	2.5	0.46
24V	20	130	6.2	2.5	0.46
48V	40.2	270	5.1	2.5	0.46

Trim Resistor Values

The value of R_{trim_up} defined as:

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

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 and V_r are internal components.

For example: to trim-up the output voltage of 12V module (CHB100-110S12) by 5% to 12.6V, R_{trim_up} is calculated as follows:

$V_o – V_{o\_nom}$ = 12.6 – 12 = 0.6V

R1 = 9.1 KΩ , R2 = 51 KΩ , R3 = 5.1KΩ ,

V_r= 2.5 V , V_f=0.46 V

$$R_{trim\_up} = \frac{18.944}{0.6} - 4.636 = 26.94\ (K\Omega)$$

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 V_r are internal components.

For example: to trim-down the output voltage of 12V module (CHB100-110S12) 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 = 51 KΩ, V_r = 2.5 V

$$R_{trim\_down} = \frac{9.1 \times (11.4 - 2.5)}{0.6} - 51 = 83.98\ \ (K\Omega)$$

The typical value of R_{trim_up}

	12V	15V	24V	48V
Trim up %	R_{trim_up}(KΩ)			
1%	153.23	160.73	165.83	166.56
2%	74.30	76.77	79.95	80.78
3%	47.99	48.78	51.33	52.18
4%	34.83	34.79	37.02	37.89
5%	26.94	26.39	28.43	29.31
6%	21.68	20.80	22.71	23.59
7%	17.92	16.80	18.62	19.50
8%	15.10	13.80	15.55	16.44
9%	12.90	11.47	13.17	14.06
10%	11.15	9.60	11.26	12.15

The typical value of R_{trim_down}

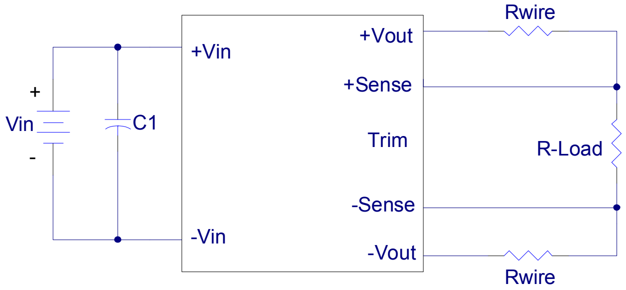
	12V	15V	24V	48V
Trim up %	R_{trim_down}(KΩ)			
1%	660.32	932.00	1641.67	3500.43
2%	300.11	432.00	745.83	1595.11
3%	180.04	265.33	447.22	960.01
4%	120.00	182.00	297.92	642.46
5%	83.98	132.00	208.33	451.93
6%	59.97	98.67	148.61	324.90
7%	42.82	74.86	105.95	234.18
8%	29.95	57.00	73.96	166.13
9%	19.95	43.11	49.07	113.20
10%	11.94	32.00	29.17	70.86

6.9 Output Remote Sensing

The CHB100-110S 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 CHB100-110S 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 $V_{o\_nominal}$

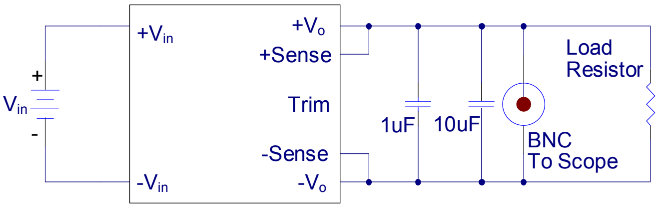
If the remote sense feature is not to be used, the sense pins should be connected locally. The +Sense pin should be connected to the +Vout pin at the module and the -Sense pin should be connected to the -Vout pin at the module. This is shown in the schematic below.



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.

6.10 Output Ripple and Noise



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

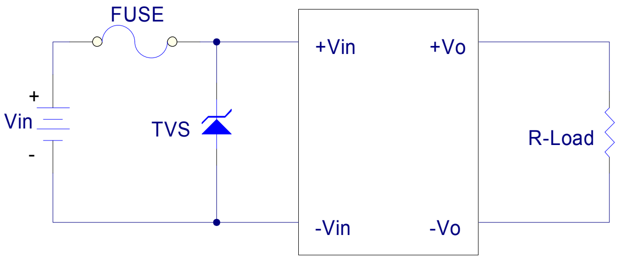
6.11 Output Capacitance

The CHB100-110S 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

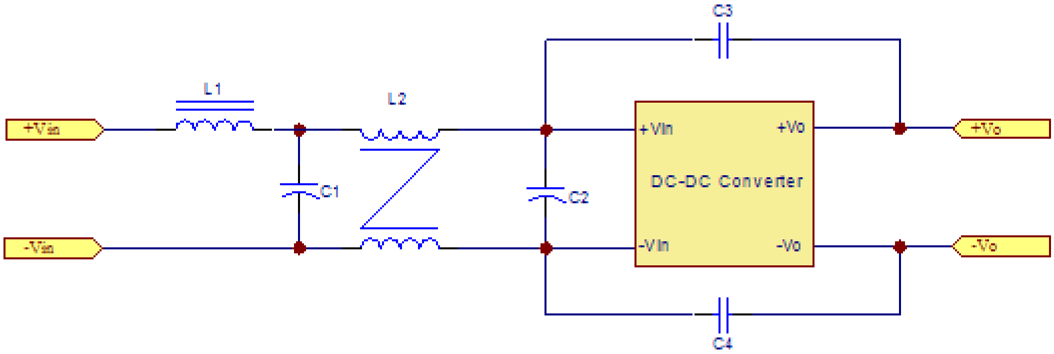
7.1 Input Fusing and Safety Considerations

The CHB100-110S series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a time delay fuse 4A,. 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

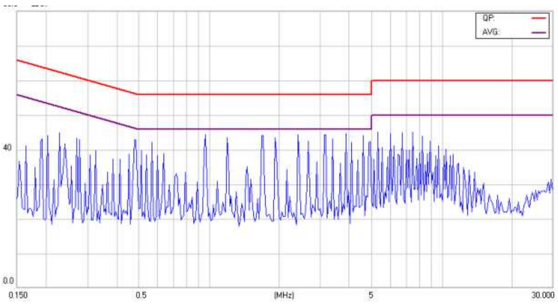
(1) EMI Test standard: EN55032 Class B Conducted Emission
Test Condition: Input Voltage: Nominal, Output Load: Full Load



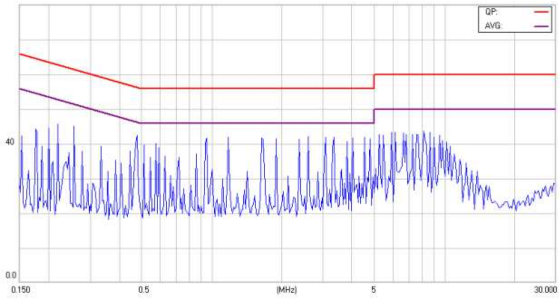
Model No.	C1	C2	C3	C4	L1	L2
CHB100-110S12	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S15	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S24	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S48	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH

Note: C1, C2 Aluminum Capacitors and C3, C4 Ceramic Capacitors

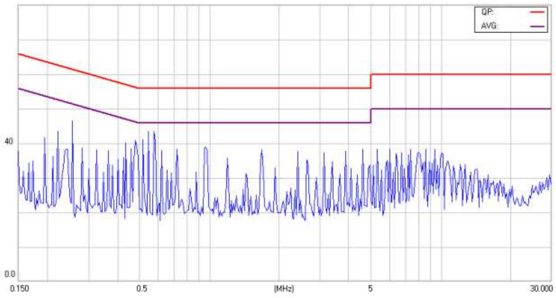
EMI and conducted noise meet EN55032 Class B



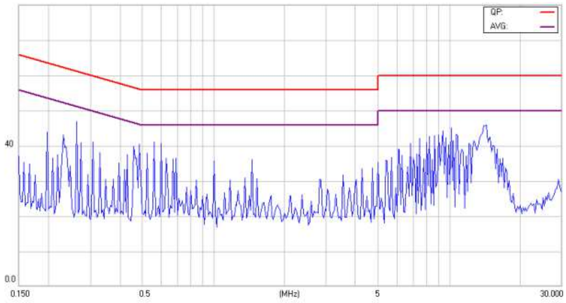
Conducted Class B of CHB100-110S12



Conducted Class B of CHB100-110S15

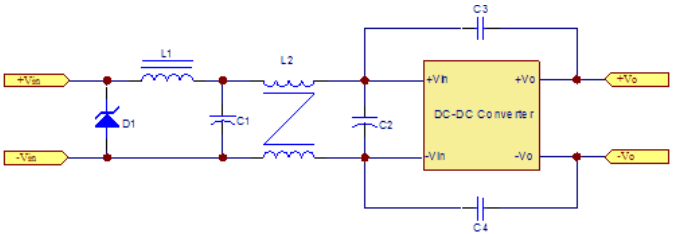


Conducted Class B of CHB100-110S24



Conducted Class B of CHB100-110S48

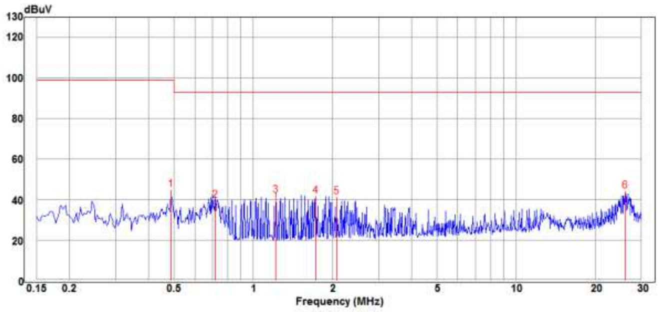
(2) EMC Test standard: EN50121-3-2 (EN55011 Class A Conducted & Radiated Emission)
Test Condition: Input Voltage: Nominal, Output Load: Full Load



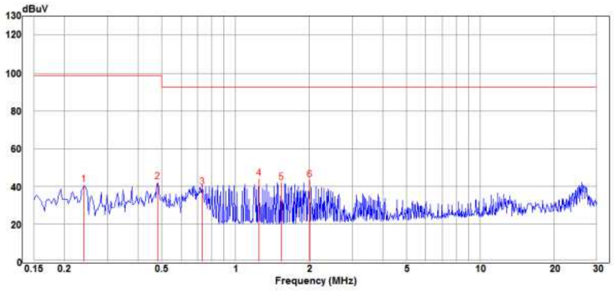
Model No.	D1	C1	C2	C3	C4	L1	L2
CHB100-110S12	1.5KE180A Littelfuse	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S15	1.5KE180A Littelfuse	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S24	1.5KE180A Littelfuse	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH
CHB100-110S48	1.5KE180A Littelfuse	220uF/200V YXF	220uF/200V YXF	2200pF	2200pF	5uH	0.5mH

Note: C1, C2 Aluminum Capacitors and C3, C4 Ceramic Capacitor

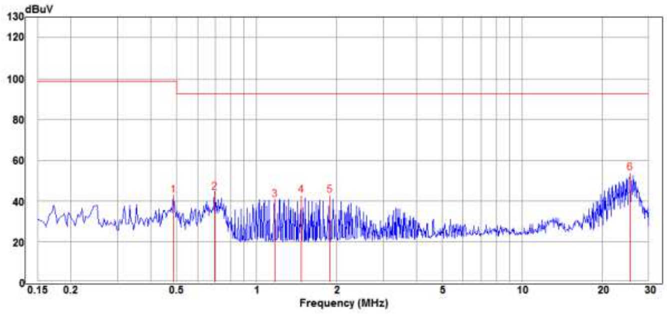
EMI and conducted noise meet EN55011 Class A



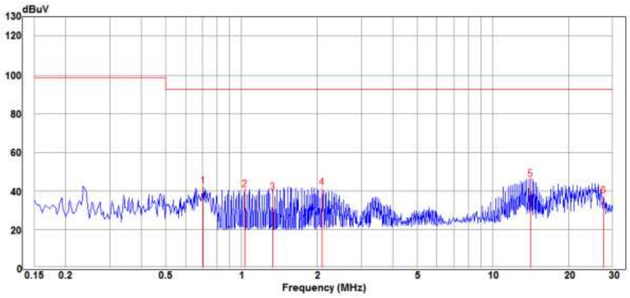
Conducted Class A of CHB100-110S12



Conducted Class A of CHB100-110S15

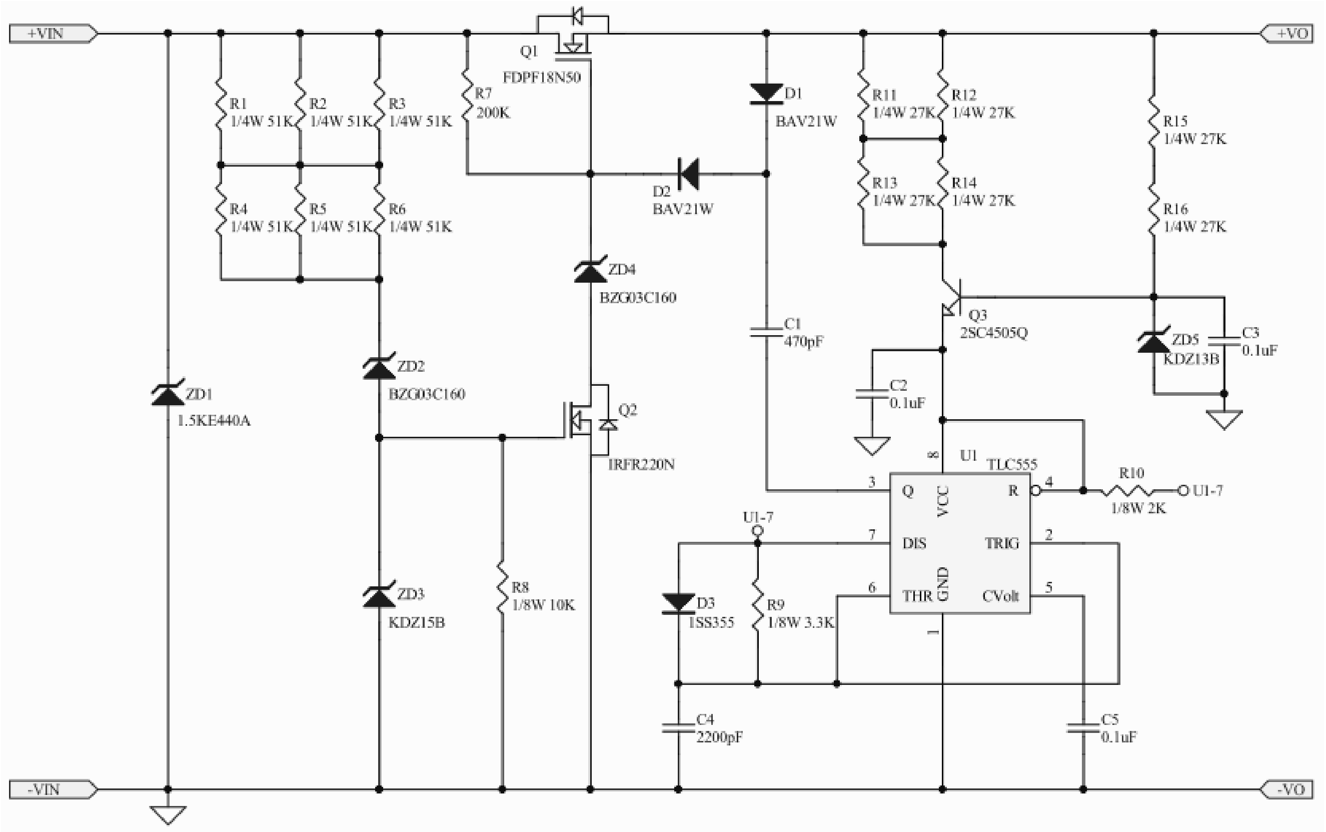


Conducted Class A of CHB100-110S24



Conducted Class A of CHB100-110S48

7.3 Suggested Configuration for RIA12 Surge Test



8. Part Number

Format: CHB100– II X OO

Parameter	Series	Nominal Input Voltage	Number of Outputs	Output Voltage
Symbol	CHB100	II	X	OO
Value	CHB100	110: 110 Volts	S: Single	12: 12 Volts 15: 15 Volts 24: 24 Volts 48: 48 Volts

9. Mechanical Specifications

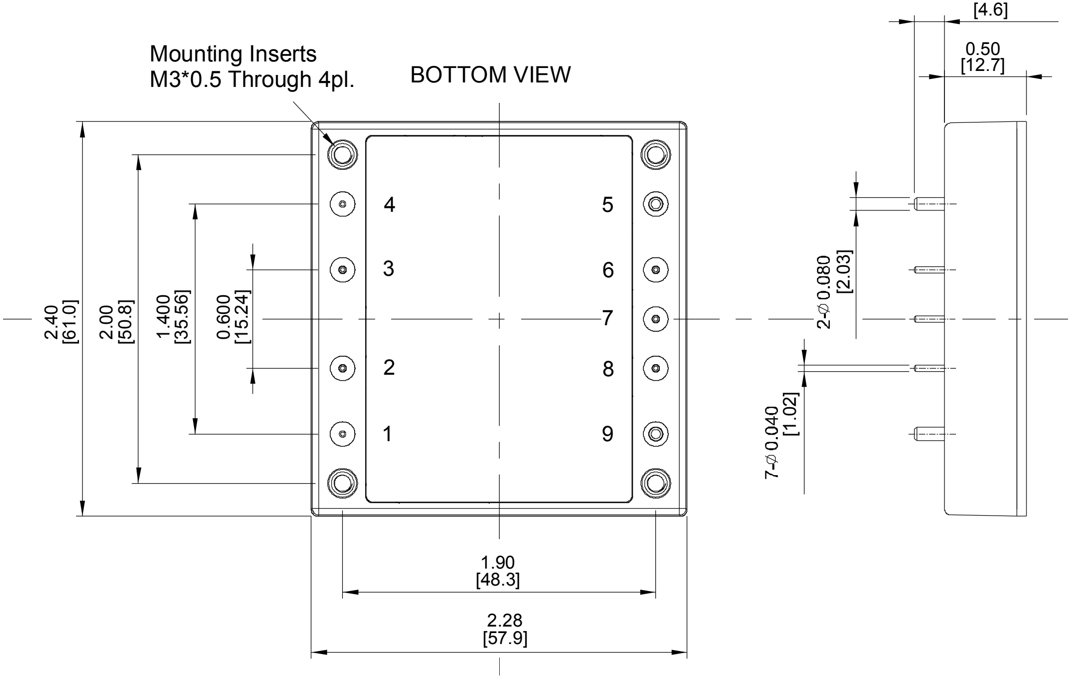
9.1 Mechanical Outline Diagrams

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	NC
4	-V Input
5	-V Output
6	-Sense
7	Trim
8	+Sense
9	+V Output

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