



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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■ Features :

- Half-brick size (2.28"X2.4"X0.5") with industry standard pin out
- 2:1 wide input range
- Protections: Short circuit / Over current / Over voltage / Over temperature
- High efficiency up to 89%
- 1500VDC I/O isolation
- Built-in remote ON/OFF control
- Built-in remote sense function
- Trimming output $\pm 10\%$
- Five-sided shield metal case
- Optional heat sinks for extended operating temperature
- Output 2.5V/3.3V/15V available
- Approvals: UL / CUL / CE
- 3 years warranty



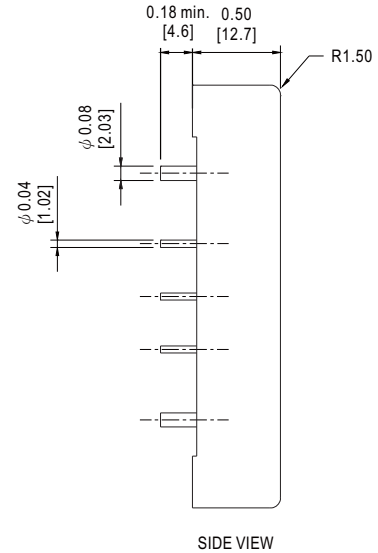
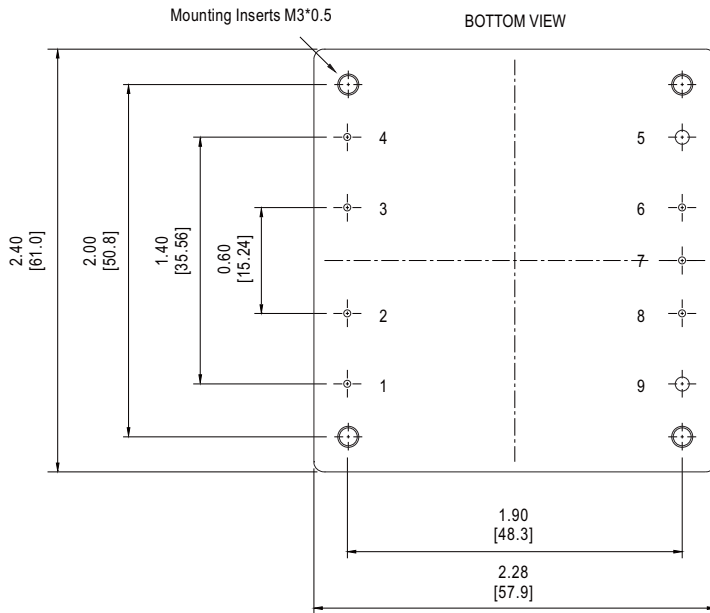
SPECIFICATION

MODEL	MHB100-24S05	MHB100-24S12	MHB100-24S24	MHB100-48S05	MHB100-48S12	MHB100-48S24		
OUTPUT	DC VOLTAGE	5V	12V	24V	5V	12V	24V	
	CURRENT RANGE	0 ~ 20A	0 ~ 8.3A	0 ~ 4.17A	0 ~ 20A	0 ~ 8.3A	0 ~ 4.17A	
	RATED POWER	100W						
	RIPPLE & NOISE (max.) Note.2	100mVp-p	150mVp-p	240mVp-p	100mVp-p	150mVp-p	240mVp-p	
	VOLTAGE ACCURACY Note.3	$\pm 1.0\%$						
	LINE REGULATION	$\pm 0.2\%$						
	LOAD REGULATION	$\pm 0.2\%$						
	SWITCHING FREQUENCY (Typ.)	500KHz						
	EXTERNAL TRIM ADJ. RANGE (Typ.)	$\pm 10\%$						
EXTERNAL CAPACITIVE LOAD (max.)	20000uF	8300uF	4170uF	20000uF	8300uF	4170uF		
INPUT	RATED DC INPUT	24VDC			48VDC			
	VOLTAGE RANGE	18 ~ 36VDC			36 ~ 75VDC			
	SURGE VOLTAGE (100ms max.)	50VDC			100VDC			
	UNDER VOLTAGE LOCKOUT	Power up: 17VDC, Power down: 16VDC			Power up: 34VDC, Power down: 32.5VDC			
	EFFICIENCY (Typ.)	84%	87%	87%	86%	89%	88%	
	DC CURRENT	FULL LOAD	5020mA	4880mA	4905mA	2480mA	2445mA	2465mA
		NO LOAD	50mA			50mA		
FILTER	Pi-network							
PROTECTION	OUTPUT OVER CURRENT	110 ~ 140% rated output power Protection type : Over current limiting, recovers automatically after fault condition is removed						
	OUTPUT OVER VOLTAGE (Typ.)	115 ~ 140% rated output voltage Protection type : Output voltage clamp						
	OUTPUT SHORT CIRCUIT	Protection type : Can be continuous, recovers automatically after fault condition is removed						
	OVER TEMPERATURE	100°C $\pm 5^\circ\text{C}$ of case temperature						
FUNCTION OPERATING	REMOTE CONTROL	Please refer to "Remote ON/OFF Control" for details						
	OUTPUT TRIMMING	$\pm 10\%$, Please refer to "External Output Trimming" for details						
ENVIRONMENT	WORKING TEMPERATURE (Typ.)	-40 ~ +100°C ; Thermal shutdown at 100°C $\pm 5^\circ\text{C}$ of case temperature (please refer to "Thermal Curve")						
	WORKING HUMIDITY	0% ~ 95% RH max.						
	STORAGE TEMP., HUMIDITY	-55 ~ +105°C, 0 ~ 95% RH						
	TEMP. COEFFICIENT	$\pm 0.03\%/^\circ\text{C}$ (0~60°C)						
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL60950-1, EAC TP TC 004 approved						
	ISOLATION VOLTAGE	I/P-O/P:1500VDC, I/P-Case:1500VDC, O/P-Case:1500VDC						
	ISOLATION RESISTANCE	I/P-O/P:100M Ohms / 500VDC / 25°C / 70% RH						
	EMC EMISSION	Compliance to EN55032 (CISPR32) Class A with external components (please refer to "EMC Suggestion Circuit"), EAC TP TC 020						
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8; EN55024, light industry level, criteria A, EAC TP TC 020						
OTHERS	CASE MATERIAL	Aluminum						
	MTBF	900K hrs typ. MIL-HDBK-217F (25°C)						
	DIMENSION	57.9*61*12.7mm (2.28"*2.40"*0.5") (L*W*H)						
	WEIGHT	95g						
NOTE	<ol style="list-style-type: none"> 1. All parameters NOT specially mentioned are measured at 24,48VDC input, rated load and 25°C of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 1uf ceramic & 10uf tantalum capacitor across output. 3. The power supply need to connect "+Vout" to "+R.S" and "-Vout" to "-R.S". 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies." 							

Mechanical Specification

Unit:inch[mm]

All Dimensions In Inches [mm]
 Tolerance Inches: X.XX= ±0.02 , X.XXX= ±0.010
 Millimeters: X.X= ±0.5 , X.XX=±0.25



Pin No. Assignment

Pin No.	Assignment	Pin No.	Assignment	Pin No.	Assignment
1	+Vin	4	-Vin	7	Trim
2	R.C.	5	-Vout	8	+R.S.
3	Case	6	-R.S.	9	+Vout

Remote ON/OFF Control

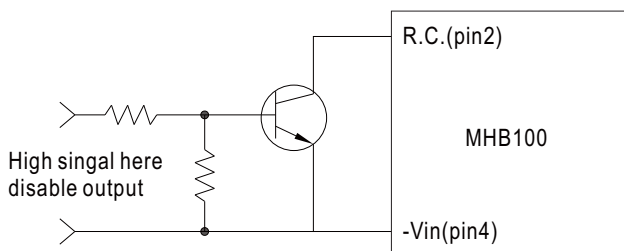
The MHB100 series allow the user to switch the power ON and OFF electronically by their remote ON/OFF feature. The MHB100 series are available with "Positive Logic" (standard) or "Negative Logic" (option).

Logic table

Logic State(pin2)	Positive logic	Negative logic
Logic Low-Switch Closed	Power OFF(<0.8Vdc)	Power ON(<0.8Vdc)
Logic High-Switch Open	Power ON(Open circuit)	Power OFF(Open circuit)

Note: 1.Logic compatibility : R.C.(pin2) ~ -Vin(pin4).

2.Suffix "N" to the model number with Negative logic remote ON/OFF.



Example control circuit(positive logic)

■ External Output Trimming

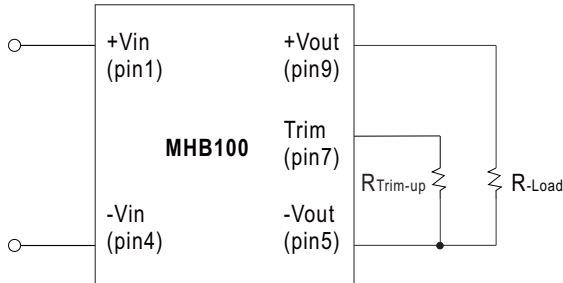


Figure 1 : Trim-up voltage setup

The value of $R_{Trim-up}$ defined as:

$$R_{Trim-up} = \frac{(R1-R2 \times (V_o - V_{o, nom}))}{(V_o - V_{o, nom})} (K\Omega)$$

Where: $R_{Trim-up}$ is the external resistor in Kohm.

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

V_o is the desired output voltage.

$R1$ and $R2$ are inside the unit and list in Table 1

Output Voltage(V)	R1 (Kohm)	R2 (Kohm)
5V	5.8	3.3
12V	18.945	4.636
24V	41.442	6.977

Table 1

For example, to Trim-up the output voltage of 5.0V model (MHB100-48S05)

by 8% to 5.4V, $R_{Trim-up}$ is calculated

as follows:

$$V_o - V_{o, nom} = 5.4 - 5.0 = 0.4V$$

$$R1 = 5.8 \text{ Kohm}$$

$$R2 = 3.3 \text{ Kohm}$$

$$R_{Trim-up} = \frac{5.8 - 3.3 \times 0.4}{0.4} = 11.2 (K\Omega)$$

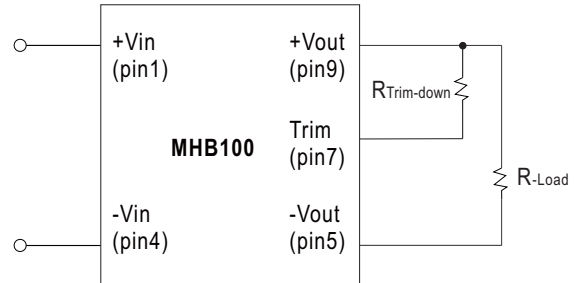


Figure 2 : Trim-down voltage setup

The value of $R_{Trim-down}$ defined as:

$$R_{Trim-down} = \frac{(R1 - R2 \times (V_o, nom - V_o))}{(V_o, nom - V_o)} (K\Omega)$$

Where: $R_{Trim-down}$ is the external resistor in Kohm.

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

V_o is the desired output voltage.

$R1$ and $R2$ are inside the unit and list in Table 2.

Output Voltage(V)	R1 (Kohm)	R2 (Kohm)
5V	5.8	5.32
12V	86.45	60.1
24V	430	120

Table 2

For example, to Trim-down the output

Voltage of 5.0V model (MHB100-48S05)

by 8% to 4.6V, $R_{Trim-down}$ is

calculated as follows :

$$V_{o, nom} - V_o = 5.0 - 4.6 = 0.4 V$$

$$R1 = 5.8 \text{ Kohm}$$

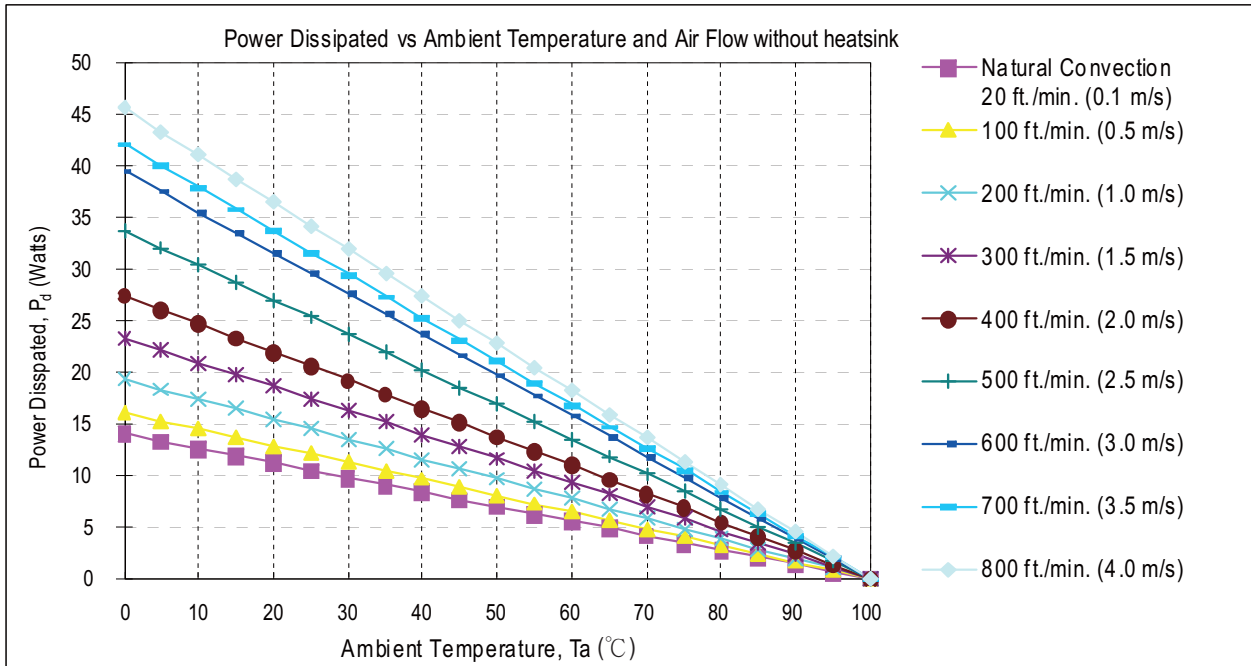
$$R2 = 5.32 \text{ Kohm}$$

$$R_{Trim-down} = \frac{5.8 - 5.32 \times 0.4}{0.4} = 9.18 (K\Omega)$$

Thermal Curve

The operating case temperature range of MHB-100 series is -40°C to +100°C. When operate the MHB-100 series, proper de-rating or cooling is needed.

The maximum case temperature under any operating condition should not be exceed 100°C. The following curve is the de-rating curve of MHB-100 series without heat sink.



Air Flow Rate	Typical Rca	Air Flow Rate	Typical Rca
Natural convection 20ft./min. (0.1m/s)	7.12°C/W	500 ft./min. (2.5m/s)	2.96°C/W
100 ft./min. (0.5m/s)	6.21°C/W	600 ft./min. (3.0m/s)	2.53°C/W
200 ft./min. (1.0m/s)	5.17°C/W	700 ft./min. (3.5m/s)	2.37°C/W
300 ft./min. (1.5m/s)	4.29°C/W	800 ft./min. (4.0m/s)	2.19°C/W
400 ft./min. (2.0m/s)	3.64°C/W		

Rca : Thermal resistance from case to ambience

Example:

What is the minimum airflow necessary for a MHB100-48S12 operates at nominal line, an output current of 8.3A, and a maximum ambient temperature of 40°C?

Solution:

Given: Vin=48Vdc, Vo=12Vdc, Io=8.3A, η (unit efficiency)=89%

Determine Power dissipation (Pd):

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

$$P_d = 12 \times 8.3 \times (1 - 0.89) / 0.89 = 12.31 \text{ Watts}$$

Determine airflow:

Given: Pd=12.31W and Ta=40°C

Check Thermal Curve above:

minimum airflow= 300 ft./min.

Verifying: The maximum temperature rise $\Delta T = P_d \times R_{ca} = 12.31 \times 4.29 = 52.8^\circ\text{C}$

The maximum case temperature $T_c = T_a + \Delta T = 92.8^\circ\text{C} < 100^\circ\text{C}$

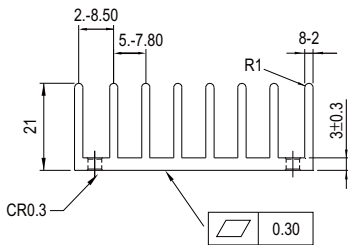
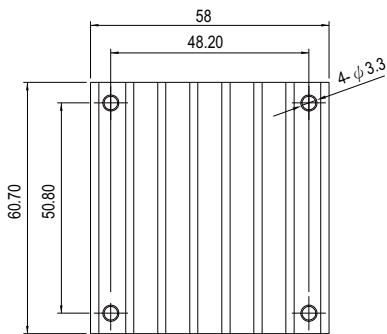
Where: The Rca is thermal resistance from case to ambience.

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

■ Case Heat Sink (Optional)

Unit:mm

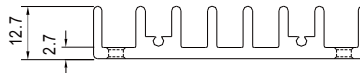
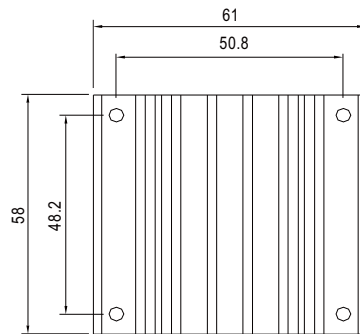
Model No.: M-C308 (Vertical Fins)



Rca:

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

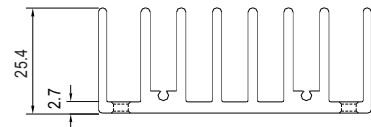
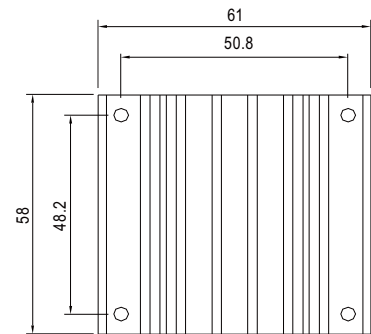
Model No.: M-C091(Horizontal Fins)



Rca:

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

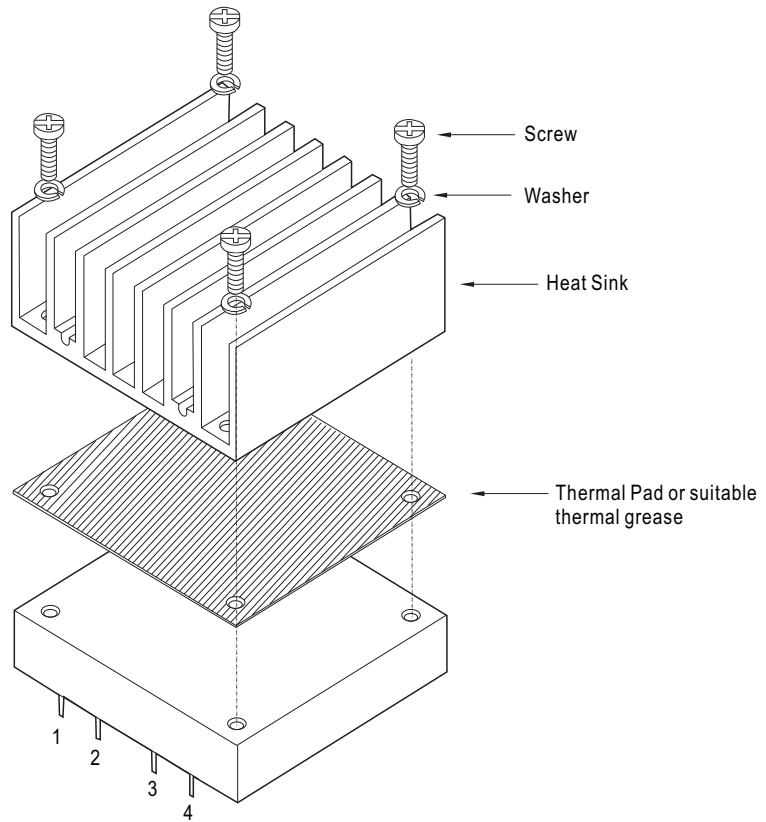
Model No.: M-C092 (Horizontal Fins)



Rca:

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

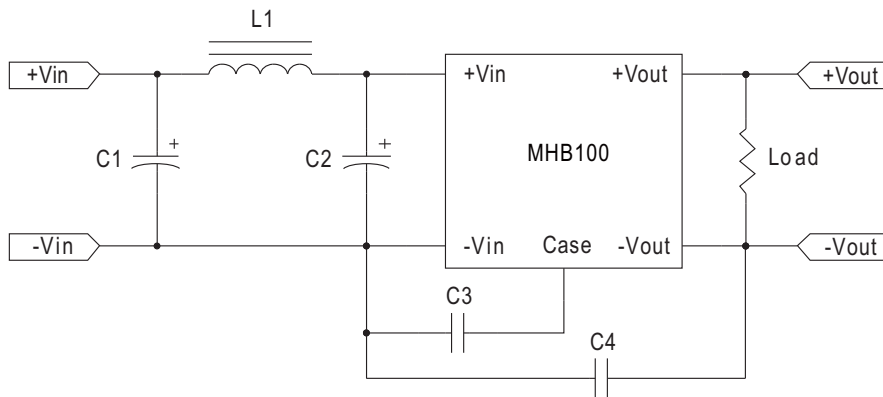
■ Heatsink Assembly



Heat Sink Order No.:
 M-C308
 M-C091
 M-C092
 Thermal Pad: 56.9x60x0.25mm
 Screw: SMP+SW M3x8L

■ EMC Suggestion Circuit

※Required external components to meet EN55022 class A conducted emission are as below:



Model No.	C1	C2	C3	C4	L1
MHB100-24S□	220uF/50V ESR<0.13Ω	220uF/50V ESR<0.13Ω	2200pF	N.C	3.4uH
MHB100-48S□	47uF/100V ESR<0.17Ω	47uF/100V ESR<0.17Ω	1000pF	1000pF	3.4uH

□ =05,12,24