

# HALF-BRICK DC-DC CONVERTERS

## 4:1 WIDE INPUT RANGE UP TO 200 WATTS

### RAILWAY APPLICATIONS

### HWB200 SERIES



#### FEATURES

- 4:1 Ultra Wide Input Range
- Half Brick Package 2.28" × 2.40" × 0.50"
- No Minimum Load Required
- High Efficiency Up to 91%
- Remote Control
- 2250Vdc Basic Insulation (24 and 48Vin)
- UL60950-1, EN60950-1, IEC60950-1 Safety Approvals
- Meets: EN50155, EN50121-3 and EN61373
- CE Marked
- Compliant to RoHS & Reach
- Railway System Applications

#### SELECTION GUIDE All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Input Voltage Range Vdc	Output Voltage Vdc	Output Current at Full Load A	Input Current at No Load mA	Efficiency %	*Model Number	Maximum Capacitor Load µF
9 ~ 36	3.3	50	25	87	HWB200-12S3P3	151000
9 ~ 36	5	36	90	90	HWB200-12S05	72000
8.5 ~ 36	12	15	90	90	HWB200-12S12	12500
8.5 ~ 36	15	12	55	90	HWB200-12S15	8000
8.5 ~ 36	24	7.5	70	90	HWB200-12S24	3100
8.5 ~ 36	28	6.5	55	90	HWB200-12S28	2300
8.5 ~ 36	48	3.7	75	89	HWB200-12S48	770
16.5 ~ 75	3.3	50	20	88	HWB200-24S3P3	151000
16.5 ~ 75	5	40	35	91	HWB200-24S05	80000
16.5 ~ 75	12	18	45	91	HWB200-24S12	15000
16.5 ~ 75	15	15	45	91	HWB200-24S15	10000
16.5 ~ 75	24	9	40	93	HWB200-24S24	3700
16.5 ~ 75	28	7.5	50	93	HWB200-24S28	2600
16.5 ~ 75	48	4.5	50	91	HWB200-24S48	930
43 ~ 160	3.3	60	20	90	HWB200-48S3P3	181000
43 ~ 160	5	46	20	91	HWB200-48S05	92000
43 ~ 160	12	21	25	91	HWB200-48S12	17500
43 ~ 160	15	17	25	93	HWB200-48S15	11300
43 ~ 160	24	10.5	25	92	HWB200-48S24	4300
43 ~ 160	28	9	25	92	HWB200-48S28	3200
43 ~ 160	48	5.2	25	92	HWB200-48S48	1000

\* All standard units are negative Remote ON/OFF control logic. For positive Remote ON/OFF control logic, use Suffix "P".

#### Terminal Block Type Model Numbers:

Suffix "T": Without EMC filter

Suffix "TF": Integrated EMC filter and meets EN55032 Class A

Suffix "TF1": Integrated EMC filter and meets EN55032 Class A, can be connected to PE

#### Heat Sink Model Numbers:

Suffix "HS", "HS2": Vertical Fin Orientation

Suffix: "HS1", "HS3": Horizontal Fin Orientation

See page 6 for details.

## HWB200 SERIES

Input Specifications			Output Specifications				
Operating input voltage range, Vdc	9 Min., 24 Typ., 36 Max.	24Vin(nom), 3.3 & 5Vout	Voltage accuracy, %	-1 Min., +1 Max.			
	8.5 Min., 24 Typ., 36 Max.	Others		Line regulation, %	-0.1 Min., +0.1 Max. Low Line to High Line at Full Load		
	16.5 Min., 48 Typ., 75 Max.	48Vin(nom)			Load regulation, %	-0.1 Min., +0.1 Max. No Load to Full Load	
	43 Min., 110 Typ., 160 Max.	110Vin(nom)				Voltage and adjustability, %	-20 Min., +10 Max. Maximum output deviation is inclusive of remote sense
Start up voltage, Vdc	9 Max.	24Vin(nom)	Remote sense, %	10 Max. % of Vout(nom), If remote sense is not being used, Sense pins should be connected to corresponding polarity OUTPUT pins.			
	18 Max.	48Vin(nom)		Ripple and noise, mVp-p	75 Typ. Measured by 20MHz bandwidth With a 1µF/25V X7R MLCC and a 22µf/25V POS-CAP, 3.3Vout, 5Vout		
	43 Max.	110Vin(nom)			100 Typ. With a 1µF/25V X7R MLCC and a 22µf/25V POS-CAP, 12Vout, 15Vout		
Shutdown voltage, Vdc	7.3 Min., 8.1 Max.	24Vin(nom)			200 Typ. With a 4.7µF/50V X7R MLCC, 24Vout, 28Vout		
	15.5 Min., 16.3 Max.	48Vin(nom)	300 Typ. With a 2.2µF/100V X7R MLCC, 48Vout, 53Vout				
	33.0 Min., 36.0 Max.	110Vin(nom)	Temperature coefficient, %/°C	-0.02 Min., +0.02 Max.			
Start up time, ms	Constant resistive load			Transient response recovery time, µs	200 Typ., 250 Max. 25% load step change		
	75 Typ.	Power up			Over voltage protection, %	115 Min., 130 Max. % of Vout(nom); Hiccup mode	
	75 Typ.	Remote ON/OFF	Over load protection, %			120 Min., 150 Max. % of Iout rated; Hiccup mode, 110Vin(nom)	
Input surge voltage, Vdc	1 second, max.			Short circuit protection	Continuous, automatic recovery		
	50 Max.	24Vin(nom)					
	100 Max.	48Vin(nom)					
Input filter <sup>(1)</sup>	Pi type						
	Referred to -Vin pin						
	Short or 0 - 1.2 Vdc	Negative logic, DC-DC ON (Standard), no Suffix					
Remote ON/OFF	Open or 3 - 12 Vdc	DC-DC OFF					
	Open or 3 - 12 Vdc	Positive logic, DC-DC ON (Option), Suffix "P"					
	Short or 0 - 1.2 Vdc	DC-DC OFF					
	-0.5 Min., 1 Max., mA	Input current of Ctrl pin					
	3mA Typ.	Remote off input current					
Sync pin signal <sup>(2)</sup> , Vdc	-0.3 Min., 5.6 Max.						

General Specifications				
Isolation voltage, Vdc	1 minute (Basic insulation)	Input to Output	2250 Min.	
	1 minute (Basic insulation)	Input (Output) to Case	1600 Min.	
Isolation resistance, GΩ	500Vdc		1 Min.	
Isolation capacitance, pF				2500 Max.
Switching frequency, kHz			225 Min.	250 Typ. 275 Max.

## HWB200 SERIES

Environmental Specifications			
Operating case temperature, °C		-40 Min.	+115 Max.
Over temperature protection, °C			+120 Typ.
Storage temperature range, °C	Terminal block type	-40 Min.	+105 Max.
	Others	-55 Min.	+125 Max.
Thermal impedance <sup>(3)</sup> , °C/W	Vertical direction by natural convection (20LFM)		
	Module without assembly option		6.1 Typ.
	Only mount on the iron base-plate		2.8 Typ.
	Heat-sink type with 0.24" Height		5.1 Typ.
	Heat-sink type with 0.45" Height		4.6 Typ.
Thermal shock		MIL-STD-810F	
Vibration		MIL-STD-810F	
Relative humidity		5% to 95% RH	

Physical Specifications		EMC Specifications			
Design meet safety standard	UL60950-1, EN60950-1, IEC60950-1, CE	Specifications	Conditions	Level	
Case material	Metal	EMI <sup>(3)</sup>	EN55022	Class A	
Base material	FR4 PCB			Class B	
Potting material	Silicone (UL94 V-0)	ESD	EN61000-4-2	Air ±8kV and Contact ±6kV	Perf. Criteria A
Weight	105g (3.7oz)	Radiated immunity	EN61000-4-3	20V/m	Perf. Criteria A
MTBF	3.182×10 <sup>5</sup> hrs, MIL-HDBK-217F, Full load	Fast transient <sup>(4)</sup>	EN61000-4-4	±2kV	Perf. Criteria A
Dimensions	2.28" × 2.40" × 0.50"	Surge <sup>(4)</sup>	EN61000-4-5	EN55024 ±2kV	Perf. Criteria A
		Conducted immunity	EN61000-4-6	10Vr.m.s	Perf. Criteria A

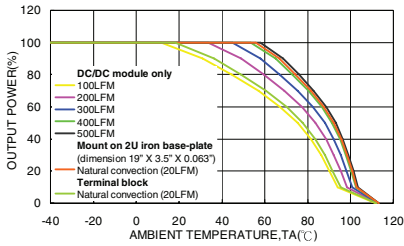
### Note:

1. Input source impedance: The power modules will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. Recommended Nippon Chemi-con KY series, 100µF/100V.
2. (1)Multiple HWB200 series module can be synchronized together simply by connecting Sync pins together. Care should be taken to ensure the ground potential differences between modules are minimized.  
(2)In this configuration all of the modules will be synchronized to the highest frequency module.  
(3)Up to three modules can be synchronized using this technique.  
(4)More relevant information in datasheet.
3. (1)Thermal test condition with vertical direction by natural convection (20LFM).  
(2)The iron base-plate dimension is 19" X 3.5" X 0.063" (The height is EIA standard 2U).  
(3) The heat-sink is optional and P/N: 7G-0021A-F , 7G-0022A-F , 7G-0023A-F , 7G-0024A-F. Please refer to heat-sink selection guide.
4. The HWB200 series standard module meets EN55022 Class A and Class B with external components.
5. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. Recommended 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V) to connect in parallel.
6. CASE GROUNDING Connecting four screw bolts to shield plane will help to reduce the EMI.
7. For further information, please contact Polytron Devices.

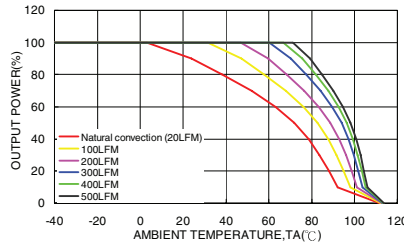
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

# HWB200 SERIES

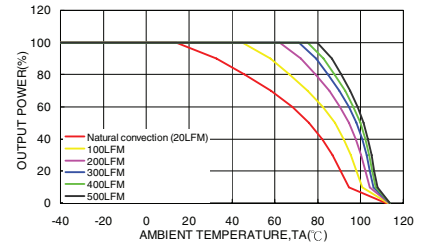
## Characteristic Curve



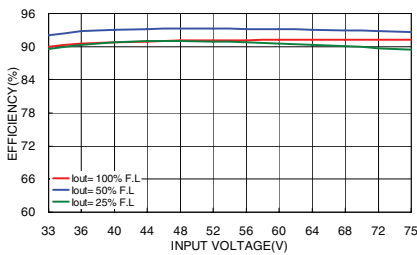
HWB200-48S05 Derating Curve (Note 2)



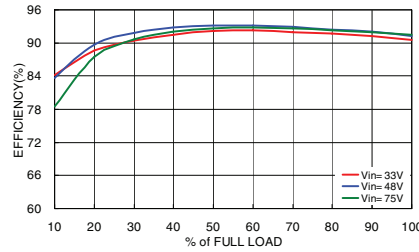
HWB200-48S05 Derating Curve (Note 2)  
With 0.24" Height Heat-sink



HWB200-48S05 Derating Curve (Note 2)  
With 0.45" Height Heat-sink

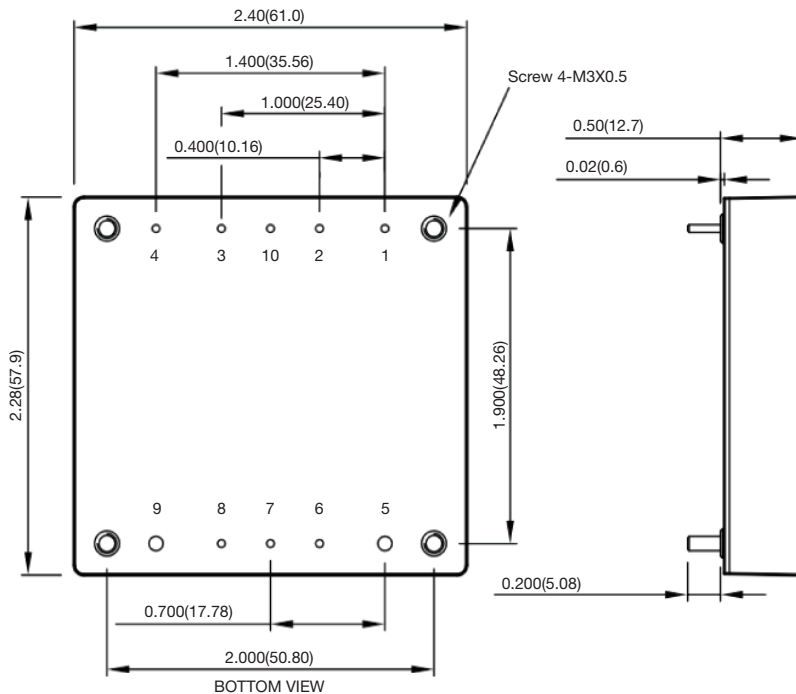


HWB200-48S05 Efficiency vs. Input Voltage



HWB200-48S05 Efficiency vs. Output Load

## Mechanical Drawing



- All dimensions in inch (mm)
- Tolerance:  $x.xx \pm 0.02$  ( $x.x \pm 0.5$ )  
 $x.xxx \pm 0.01$  ( $x.xx \pm 0.25$ )
- Pin pitch tolerance  $\pm 0.01$  (0.25)
- Pin dimension tolerance  $\pm 0.004$  (0.1)

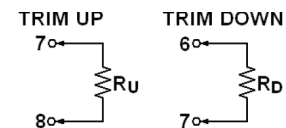
- Mounting screws should always be used.
- The screw locked torque: **MAX 5.0kgf-cm(0.49N-m)**

### PIN CONNECTION

PIN	DEFINE	DIAMETER
1	-Vin	0.04 Inch
2	Case (option)	0.04 Inch
3	Ctrl	0.04 Inch
4	+Vin	0.04 Inch
5	-Vout	0.08 Inch
6	-Sense	0.04 Inch
7	Trim	0.04 Inch
8	+Sense	0.04 Inch
9	+Vout	0.08 Inch
10	Sync (option)	0.04 Inch

### EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.



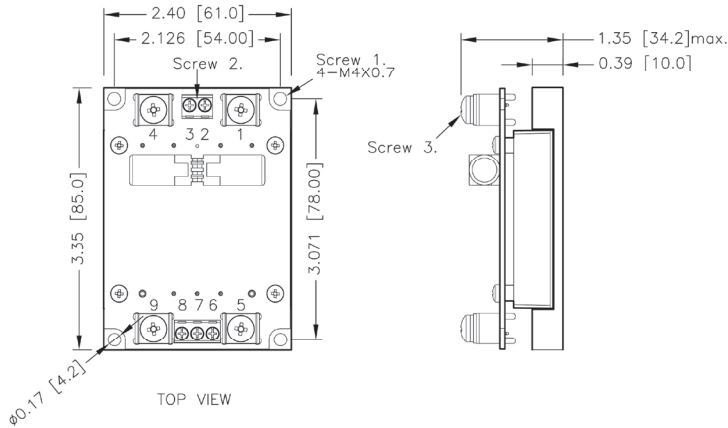
$$R_U = \left( \frac{V_{OUT} (100 + \Delta\%)}{1.225 \Delta\%} - \frac{(100 + 2\Delta\%) }{\Delta\%} \right) k\Omega$$

$$R_D = \left( \frac{100}{\Delta\%} - 2 \right) k\Omega$$

**HWB200 SERIES**

**Terminal Block Mounting Option**

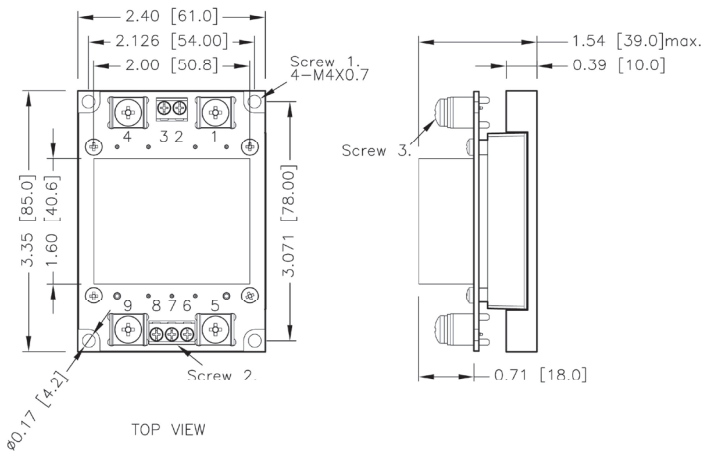
**Suffix "T"**



**PIN CONNECTION**

PIN	DEFINE
1	-Vin
2	NC
3	Ctrl
4	+Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

**Suffix "TF"**



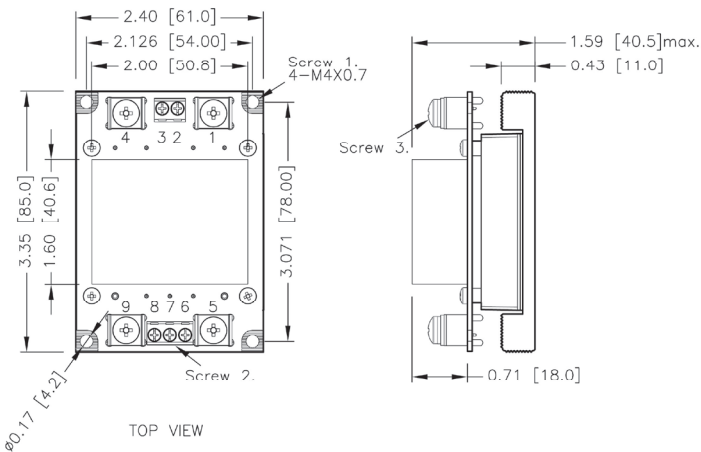
**CTRL AND PIN OPTIONS**

No Suffix	Negative logic; 0.2" pin length
Suffix "P"	Positive logic; 0.2" pin length

**ASSEMBLY OPTIONS**

Suffix "T"	Without EMC filter
Suffix "TF"	Integrated EMC filter and meets EN55032 Class A
Suffix "TF1"	Integrated EMC filter, meets EN55032 Class A and can be connected to PE

**Suffix "TF1"**

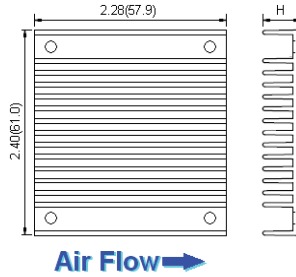
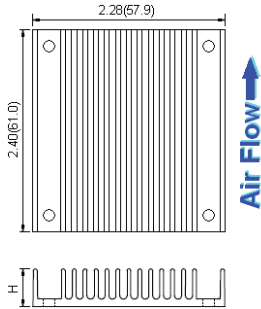


## HWB200 SERIES

### Heat-Sink Type Options

Vertical Fin Orientation, Suffix: -HS, -HS2

Horizontal Fin Orientation, Suffix: -HS1, -HS3



HS	Height H=0.45" vertical fin, 7G-0021A-F
HS1	Height H=0.24" horizontal fin, 7G-0022A-F
HS2	Height H=0.24" vertical fin, 7G-0023A-F
HS3	Height H=0.45" horizontal fin, 7G-0024A-F

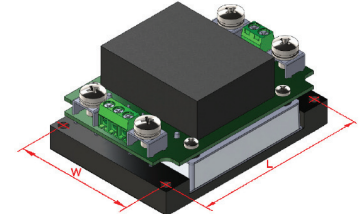
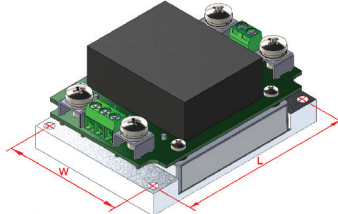
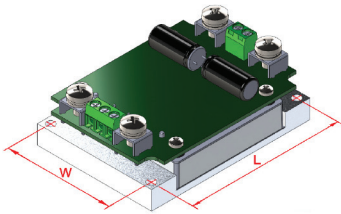
1. All dimensions in inch (mm)
2. Tolerance : x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)

### Terminal Block Type Option

Wall mounted, Suffix: -T

Wall mounted with EMC Filter, Suffix: -TF

Wall mounted with EMC Filter, Suffix: -TF1  
(Can be connected to PE)



Terminal block type	-T	-TF	-TF1
Weight	235g (8.29oz)	280g (9.88oz)	287g (10.12oz)
Dimensions	3.35 x 2.40 x 1.27 inch (85.0 x 61.0 x 32.3 mm)	3.35 x 2.40 x 1.47 inch (85.0 x 61.0 x 37.3 mm)	3.35 x 2.40 x 1.53 inch (85.0 x 61.0 x 38.8 mm)
Through hole (W×L)	2.126 x 3.071 inch (54.00 x 78.00 mm), 4-∅ 0.17 inch (∅ 4.3mm)		

For further information, please contact Polytron Devices.