



100 WATT

Single Output

Regulated
2:1 Input range
DC/DC Converters



FEATURES

- Output Current up to 25A
- 2:1 Wide Input Voltage Range
- High Efficiency Up to 93%
- No Minimum Load Required
- Soft-Start
- Adjustable Output Voltage
- Under-Voltage Lockout
- Input Reverse Protection
- Industry Standard Half-Brick Footprint
- Six-Sided Continuous Shield
- Input to Output Basic Insulation: 2250Vdc
- Bus Terminal Block Option

HWA100 Series

SPECIFICATIONS

INPUT

Voltage Range.....	12Vdc nominal input.....	9-18Vdc
.....	24Vdc nominal input....	18-36Vdc
.....	48Vdc nominal input....	36-75Vdc
Input Surge Voltage.....	12Vdc input...36Vdc	100ms. max
.....	24Vdc input...50Vdc	100ms. max
.....	48Vdc input...100Vdc	100ms. max
Start up time.....	Nominal input and	Power Up.....25mS
.....	Constant Resistive Load.....	Remote On/Off...25mS
Startup Voltage.....	12Vdc input.....	9Vdc max
.....	24Vdc input...18Vdc	max
.....	48Vdc input...36Vdc	max
Shutdown Voltage.....	12Vdc input...7.5Vdc	
.....	24Vdc input...16Vdc	
.....	48Vdc input...34Vdc	
Remote ON/OFF.....	Referenced to: -input pin	
(Negative logic).....	Standard.....	DC-DC ON.....Short or 0V < Vr < 1.2V
.....	DC-DC OFF..	
(Positive Logic).....	Option.....	DC-DC ON.....Short or 0V < Vr < 1.2V
.....	DC-DC OFF.....	Open or 3V < Vr < 12V
Input current of Remote control pin.....	DC-DC OFF.....	-0.5mA. - 1mA
Remote off state input current.....		3 mA
Input Filter.....		Pi Type

OUTPUT

Output power.....	100 Watts Max.
Voltage accuracy.....	-1% - +1%
Voltage adjustability	
.....	Maximum output deviation is inclusive of remote sense.....-20% to +10% Max.
Line Regulation.....	LL to HL at Full Load.....-0.1% to +0.1%
Load Regulation.....	No load to Full Load.....-0.1% to +0.1%
Remote Sense.....	% of Vout(nom).....10% Max
.....	If remote sense is not being used, SENSE pins should be connected to
.....	corresponding polarity OUTPUT pins.
Ripple and Noise.....	20mHZ Bandwith.....See Table
Temperature Coefficient.....	±0.02%/°C Max.
Transient Response recovery time.....	25% load step change.....200 typ., 250uS Max
Over voltage protection.....	% of Vout(nom); Hiccup mode.....115 - 130%
Over load protection.....	% of Iout rated; Hiccup mode.....110 - 140%
Short circuit protection.....	Hiccup, automatic recovery

Additional specifications on next page.



ADDITIONAL SPECIFICATIONS

GENERAL

Efficiency.....See Table
 Isolation Voltage.....Input to Output..(Basic.insulation).....2250Vdc, min. 1 minute
Input (Output) to Case.....1600Vdc, min. 1 minute
 Isolation resistance.....10⁹ ohms, min.
 Isolation capacitance.....2500pF, max.
 Switching frequency.....300KHZ Typ.
 Design meets safety standard.....IEC60950-1, UL60950-1, EN60950-1
 Case material.....Metal
 Potting material.....Silicon (UL94-VO)
 Dimensions.....2.40 x 2.28 x 0.50
(61.0 x 57.9 x 12.7 mm)
 Weight.....97 g (3.42 oz.)
 MTBF (Note 1).....BELLCORE TR-NWT-000332..Case 1: 50% Stress, Ta= 40°C..1.010 x 10⁹ hrs.
 MIL-HDBK-217F.... Ta=25°C, Full load (G/B, controlled environment).....7.416 x 10⁴ hrs.

ENVIRONMENTAL

Operating case temperature.....-40°C to +105° C
 Over temperature protection.....+115° C
 Storage temperature range.....Standard.....-55 to +125° C
Terminal Block Type.....-40 to +105° C
 Thermal impedance.....Standard..(Note 1).....6.7° C/watt
Heat-sink type with 0.24" height.....5.4° C/watt
Heat-sink type with 0.45" height.....4.7° C/watt
 Thermal shock.....MIL STD 810F
 Vibration.....MIL STD 810F
 Relative Humidity.....5% to 95% RH

EMC

EMI.....(Note 2) EN55022.....Module w/o assembly option.....Class A
EN55022.....Option TF or TF1.....Class A
 ESD.....EN61000 -4-2.....Air.+/-8KV..and Contact...+/-6KV.....Perf. Criteria A
 Radiated Immunity.....EN61000-4-3.....10 V/m.....Perf. Criteria A
 Fast transient.....EN61000-4-4.....+/-2KV.....Perf. Criteria A
 Surge.....(Note 3).....EN61000-4-5.....+/-0.5KV.....Perf. Criteria A
 Conducted immunity.....EN61000-4-6.....10Vr.m.s.....Perf. Criteria A

SELECTION GUIDE

Input Voltage Range	Output Voltage	Output Current		Output ⁽⁴⁾ Ripple & Noise	Input Current No load ⁽³⁾	Efficiency ⁽⁴⁾ (%)	Model Number	Capacitor Load max. ⁽⁵⁾
		Min. load	Full load					
12(9-18) Vdc	3.3 Vdc	0mA	25A	75mVp-p	155mA	90	HWA100-12S33	75700µF
12(9-18) Vdc	5 Vdc	0mA	20A	75mVp-p	150mA	91	HWA100-12S5	40000µF
12(9-18) Vdc	12 Vdc	0mA	8.4A	100mVp-p	180mA	91	HWA100-12S12	7000µF
12(9-18) Vdc	15 Vdc	0mA	6.7A	100mVp-p	180mA	91	HWA100-12S15	4460µF
12(9-18) Vdc	24 Vdc	0mA	4.2A	200mVp-p	90mA	90	HWA100-12S24	1750µF
12(9-18) Vdc	28 Vdc	0mA	3.6A	200mVp-p	100mA	90	HWA100-12S28	1280µF
12(9-18) Vdc	48 Vdc	0mA	2.1A	300mVp-p	100mA	90	HWA100-12S48	430µF
24(18-36) Vdc	3.3 Vdc	0mA	25A	75mVp-p	90mA	91	HWA100-24S33	75700µF
24(18-36) Vdc	5 Vdc	0mA	20A	75mVp-p	150mA	93	HWA100-24S5	40000µF
24(18-36) Vdc	12 Vdc	0mA	8.4A	100mVp-p	185mA	93	HWA100-24S12	7000µF
24(18-36) Vdc	15 Vdc	0mA	6.7A	100mVp-p	185mA	93	HWA100-24S15	4460µF
24(18-36) Vdc	24 Vdc	0mA	4.2A	200mVp-p	85mA	92	HWA100-24S24	1750µF
24(18-36) Vdc	28 Vdc	0mA	3.6A	200mVp-p	85mA	92	HWA100-24S28	±1280µF
24(18-36) Vdc	48 Vdc	0mA	2.1A	300mVp-p	85mA	92	HWA100-24S48	430µF
48(36-75) Vdc	3.3 Vdc	0mA	25A	75mVp-p	80mA	91	HWA100-48S33	75700µF
48(36-75) Vdc	5 Vdc	0mA	20A	75mVp-p	90mA	93	HWA100-48S5	40000µF
48(36-75) Vdc	12 Vdc	0mA	8.4A	100mVp-p	90mA	93	HWA100-48S12	7000 µF
48(36-75) Vdc	15 Vdc	0mA	6.7A	100mVp-p	90mA	93	HWA100-48S15	4460 µF
48(36-75) Vdc	24 Vdc	0mA	4.2A	200mVp-p	40mA	92	HWA100-48S24	1750 µF
48(36-75) Vdc	28 Vdc	0mA	3.6A	200mVp-p	40mA	92	HWA100-48S28	1280 µF
48(36-75) Vdc	48 Vdc	0mA	2.1A	300mVp-p	40mA	92	HWA100-48S48	430 µF

Notes:

- (1) Thermal test condition with vertical direction by natural convection (20LFM).
 (2) The heat-sink is optional and PIN: 7G-0021A-F , 7G-0022A-F , 7G-0023A-F , 7G-0024A-F. Please refer to heat-sink selection guide.
- The HWA100 series module w/o assembly option meets EMI Class A or Class B only with external components.
- 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.

Additional options on next page.

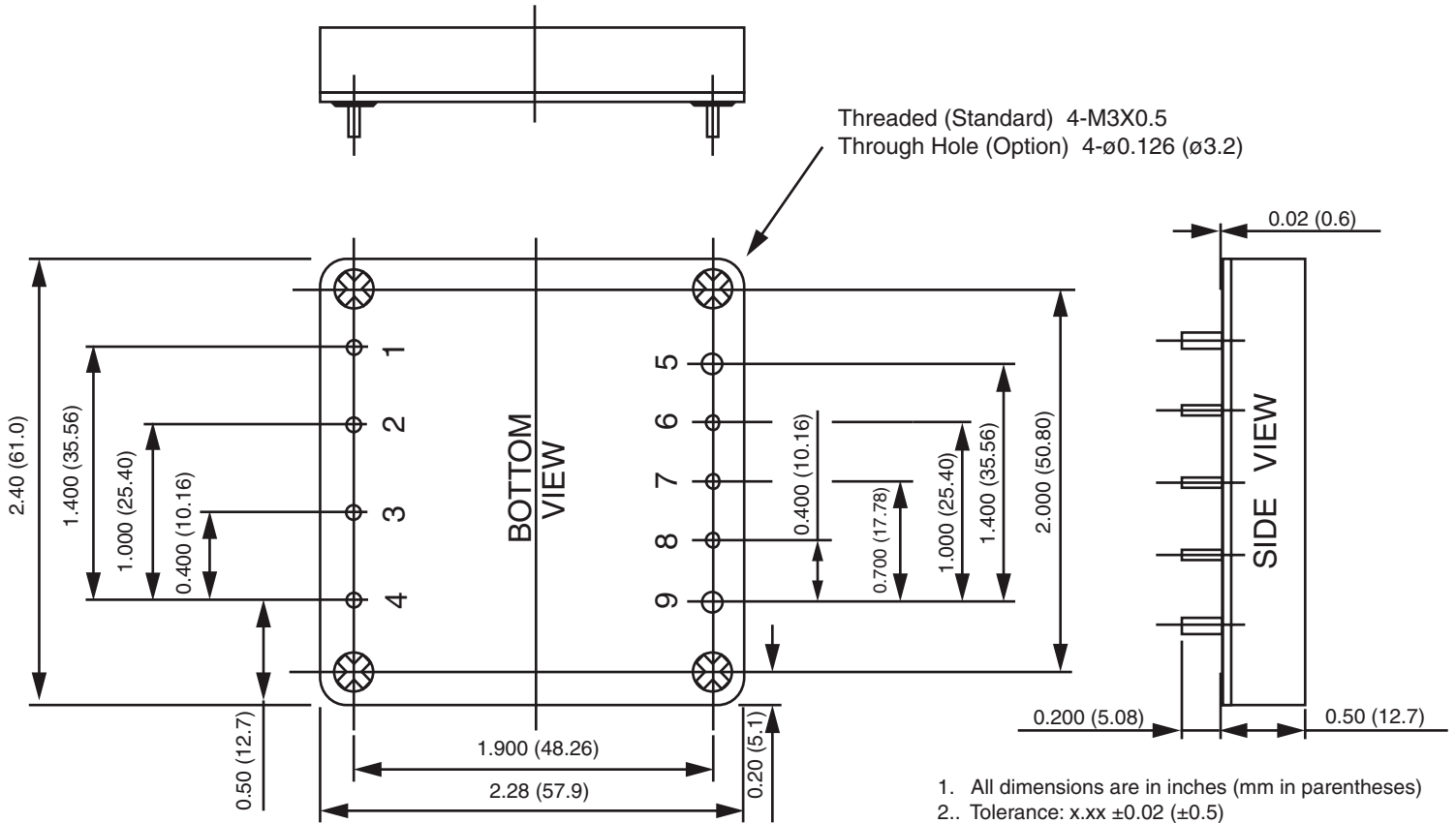


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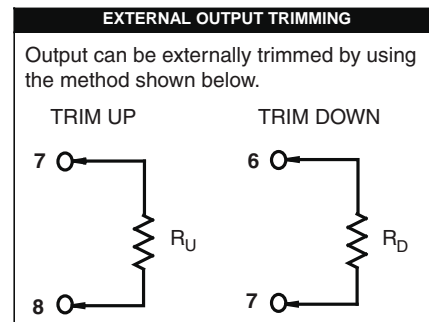
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MECHANICAL DRAWING



1. All dimensions are in inches (mm in parentheses)
- 2.. Tolerance: x.xx ±0.02 (±0.5)
x.xxx ±0.01 (±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004 (0.1)

PIN CONNECTION		
PIN	Define	Diameter
1	-INPUT	0.04 Inches
2	CASE	0.04 Inches
3	CTRL	0.04 Inches
4	+INPUT	0.04 Inches
5	-OUTPUT	0.08 Inches
6	-SENSE	0.04 Inches
7	TRIM	0.04 Inches
8	+SENSE	0.04 Inches
9	+OUTPUT	0.08 Inches



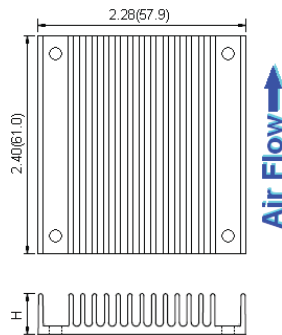
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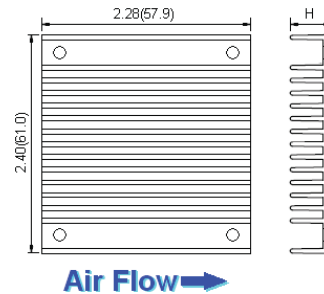
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HEAT-SINK TYPE OPTIONS

Vertical Fin Orientation, Suffix -HS, -HS2



Horizontal Fin Orientation, Suffix -HS1, -HS3



OPTIONS TABLE	
OPTION	SUFFIX
Ctrl and Pin options:	
Negative logic, 0.200" pin length	No suffix required (standard)
Negative logic, 0.145" pin length	L
Positive logic, 0.200" pin length	P
Positive logic, 0.145" pin length	S
Through hole type:	
Thread	No suffix required (standard)
No thread	TH
Heat-sink Type:	
Height H=0.45" vertical fin, 7G-0021A-F	HS
Height H=0.24" horizontal fin, 7G-0022A-F	HS1
Height H=0.24" vertical fin, 7G-0023A-F	HS2
Height H=0.45" horizontal fin, 7G-0024A-F	HS3
Terminal block type ⁽²⁾:	
Wall mounted	T
Wall mounted with EMC filter ⁽³⁾	TF
Wall mounted with EMC filter can be connected to PE ⚡ ⁽³⁾	TF1

(1) The module can't equip Heat-sink with TH option.

(2) Terminal block type only for 0.200" pin length.

(3) EMI filter meet EN55022 Class A.



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OUTPUT VOLTAGE ADJUSTMENT

Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins.

With an external resistor between the Trim and -Sense pin, the output voltage set point decreases.

With an external resistor between the Trim and +Sense pin, the output voltage set point increases.

Maximum output deviation is +10% inclusive of remote sense.

The external TRIM resistor needs to be at least 1/8W of rated power.

Trim Up Equation

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

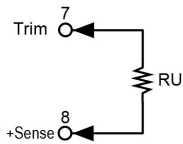
Trim Down Equation

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

EXTERNAL OUTPUT TRIMMING

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

Trim-up



S3.3

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (k Ω)	170.082	85.388	57.156	43.041	34.571	28.925	24.892	21.867	19.515	17.633

S5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.40	5.45	5.50
RU (k Ω)	310.245	156.163	104.803	79.122	63.714	53.442	46.105	40.602	36.322	32.898

S12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20
RU (k Ω)	887.388	447.592	300.993	227.694	183.714	154.395	133.452	117.745	105.528	95.755

S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50
RU (k Ω)	1134.735	572.490	385.075	291.367	235.143	197.660	170.886	150.806	135.188	122.694

S24

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40
RU (k Ω)	1876.776	947.184	637.320	482.388	389.429	327.456	283.190	249.990	224.168	203.510

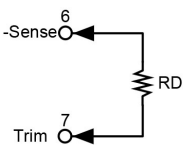
S28

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	28.28	28.56	28.84	29.12	29.40	29.68	29.96	30.24	30.52	30.80
RU (k Ω)	2206.571	1113.714	749.429	567.286	458.000	385.143	333.102	294.071	263.714	239.429

S48

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	48.48	48.96	49.44	49.92	50.40	50.88	51.36	51.84	52.32	52.80
RU (k Ω)	3855.551	1946.367	1309.973	991.776	800.857	673.578	582.665	514.480	461.447	419.020

Trim-down



S

ΔV (%)	1	2	3	4	5	6	7	8	9	10
RD (k Ω)	98.000	48.000	31.333	23.000	18.000	14.667	12.286	10.500	9.111	8.000

ΔV (%)	11	12	13	14	15	16	17	18	19	20
RD (k Ω)	7.091	6.333	5.692	5.143	4.667	4.250	3.882	3.556	3.263	3.000



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