

DC-DC CONVERTERS

2:1 AND 4:1 INPUT RANGE, UP TO 20 WATTS

MEDICAL APPLICATIONS

CWA20 AND CWB20 SERIES



FEATURES

- 2:1 and 4:1 Wide Input Voltage Range
- Miniature 1" × 1.6" Package
- High Efficiency: Up to 90%
- Reinforced Insulation: 5000Vac
- 2 X MOPP
- EMI Class A Filter
- Low Leakage Current
- Low Standby Power
- No Minimum Load Requirement
- Operating Altitude: 5000 meter
- Remote ON/OFF
- Over Current Protection
- Over Temperature Protection
- Over Voltage Protection
- Short Circuit Protection
- Under Voltage Protection
- Design Meets UL 60601-1
- CE Marked
- RoHS Compliant to 2011/65/EU

SELECTION GUIDE

All specifications are typical at 230Vac input, full load and 25°C, unless otherwise noted.

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load mA	Input Current at No Load mA	Efficiency %	Maximum Capacitor Load µF	Model Number*
9 - 18	5	4000	8	88.5	5000	CWA20-12S5
9 - 18	12	1670	12	88.5	850	CWA20-12S12
9 - 18	15	1330	13	89	700	CWA20-12S15
9 - 18	24	833	11	89	220	CWA20-12S24
18 - 36	5	4000	8	90	5000	CWA20-24S5
18 - 36	12	1670	9	90	850	CWA20-24S12
18 - 36	15	1330	9	90	700	CWA20-24S15
18 - 36	24	833	9	90	220	CWA20-24S24
36 - 75	5	4000	9	89.5	5000	CWA20-48S5
36 - 75	12	1670	9	88.5	850	CWA20-48S12
36 - 75	15	1330	9	89	700	CWA20-48S15
36 - 75	24	833	9	88.5	220	CWA20-48S24

CWA20 AND CWB20 SERIES

SELECTION GUIDE (CONTINUED)

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load mA	Input Current at No Load mA	Efficiency %	Maximum Capacitor Load μ F	Model Number*
9 - 18	\pm 5	\pm 2000	11	86	\pm 2500	CWA20-12-5
9 - 18	\pm 12	\pm 833	11	89	\pm 500	CWA20-12-12
9 - 18	\pm 15	\pm 667	14	89	\pm 350	CWA20-12-15
18 - 36	\pm 5	\pm 2000	11	86	\pm 2500	CWA20-24-5
18 - 36	\pm 12	\pm 833	9	90	\pm 500	CWA20-24-12
18 - 36	\pm 15	\pm 667	11	90	\pm 350	CWA20-24-15
36 - 75	\pm 5	\pm 2000	9	86	\pm 2500	CWA20-48-5
36 - 75	\pm 12	\pm 833	9	88.5	\pm 500	CWA20-48-12
36 - 75	\pm 15	\pm 667	9	89	\pm 350	CWA20-48-15
9 - 36	5	4000	8	88.5	5000	CWB20-24S5
9 - 36	12	1670	11	88.5	850	CWB20-24S12
9 - 36	15	1330	10	89	700	CWB20-24S15
9 - 36	24	833	10	88.5	220	CWB20-24S24
18 - 75	5	4000	9	89.5	5000	CWB20-48S5
18 - 75	12	1670	9	89.5	850	CWB20-48S12
18 - 75	15	1330	9	89	700	CWB20-48S15
18 - 75	24	833	9	88.5	220	CWB20-48SS24
9 - 36	\pm 5	\pm 2000	9	86	\pm 2500	CWB20-24-5
9 - 36	\pm 12	\pm 833	10	88.5	\pm 500	CWB20-24-12
9 - 36	\pm 15	\pm 667	11	89	\pm 350	CWB20-24-15
18 - 75	\pm 5	\pm 2000	9	86	\pm 2500	CWB20-48-5
18 - 75	\pm 12	\pm 833	9	88.5	\pm 500	CWB20-48-12
18 - 75	\pm 15	\pm 667	9	89	\pm 350	CWB20-48-15

CWA20 AND CWB20 SERIES

Input Specifications			Output Specifications		
Voltage range, Vdc	9 Min., 12 Typ., 18 Max.	12 Vin (nom), 2:1	Voltage accuracy, %	-1 Min., 1 Max.	
	18 Min., 24 Typ., 36 Max.	24 Vin (nom), 2:1	Line regulation, %	-0.2 Min., 0.2 Max.	Low line to high line at full load, Single
	36 Min., 48 Typ., 75 Max.	48 Vin (nom), 2:1		-0.5 Min., 0.5 Max.	Dual
	9 Min., 24 Typ., 36 Max.	24 Vin (nom), 4:1	Load regulation, %	-0.2 Min., 0.2 Max.	No load to full load, Single
18 Min., 48 Typ., 75 Max.	48 Vin (nom), 4:1	-1 Min., 1 Max.		Dual	
Start up voltage, Vdc	9 Max.	12 Vin (nom), 2:1	Cross regulation, %	-5 Min., 5 Max.	Asymmetrical load 25%/100% FL, Dual
	18 Max.	24 Vin (nom), 2:1		Voltage adjustability, %	-10 Min., 10 Max.
	36 Max.	48 Vin (nom), 2:1	-10 Min., 20 Max.		15Vout, 24Vout
	9 Max.	24 Vin (nom), 4:1	Measured by 20MHz bandwidth		
Shutdown voltage, Vdc	7.8 Min., 8 Typ., 8.6 Max.	12 Vin (nom), 2:1	Ripple and noise, mVp-p	50 Typ.	Single, 5Vout, With a 10µF/25V X7R MLCC
	15.8 Min., 16 Typ., 17.4 Max.	24 Vin (nom), 2:1		75 Typ.	Single, 12Vout, With a 10µF/25V X7R MLCC
	32 Min., 33 Typ., 34 Max.	48 Vin (nom), 2:1		75 Typ.	Single, 15Vout, With a 10µF/25V X7R MLCC
	7.8 Min., 8 Typ., 8.6 Max.	24 Vin (nom), 4:1		100 Typ.	Single, 24Vout, With a 4.7µF/50V X7R MLCC
15.8 Min., 16 Typ., 17.4 Max.	48 Vin (nom), 4:1	50 Typ.		Dual, ±5Vout, With a 10µF/25V X7R MLCC	
Start up time, ms	30 Typ., 60 Max.	Power up, Constant resistive load		75 Typ.	Dual, ±12Vout, With a 10µF/25V X7R MLCC
	30 Typ., 60 Max.	Remote ON/OFF		75 Typ.	Dual, ±15Vout, With a 10µF/25V X7R MLCC
Input surge voltage, Vdc		3 seconds, Max.		Temperature coefficient, %/°C	-0.02 Min., 0.02 Max.
	25 Max.	12 Vin (nom), 2:1	Transient response recovery time, µs	250 Typ.	25% load step change
	50 Max.	24 Vin (nom), 2:1		Over voltage protection, Vdc	6.2 Typ.
	100 Max.	48 Vin (nom), 2:1	15 Typ.		12Vout
	50 Max.	24 Vin (nom), 4:1	20 Typ.		15Vout
100 Max.	48 Vin (nom), 4:1	30 Typ.	24Vout		
Input filter	Pi type		Over load protection, %	150 Typ., 185 Max.	% of Iout rated; Hiccup mode
	Referred to - Vin pin		Short circuit protection	Continuous, automatic recovery	
Remote ON/OFF, mA	Open or 3.5 - 12 Vdc	DC-DC ON, Positive logic			
	Short or 0 - 1.2 Vdc	DC-DC OFF, Positive logic			
	Short or 0 - 1.2 Vdc	DC-DC ON, Negative logic			
	Open or 3.5 - 12 Vdc	DC-DC OFF, Positive logic			
	-0.5 Min., 1 Max.	Input current of Ctrl pin			
	2.5 Typ.	Remote off input current			

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General Specifications

Isolation voltage, Vac	1 minute, input to output, reinforced insulation for 250 Vac working voltage	5000 Min.		
Isolation capacitance, pF			20 Typ.	
Leakage current, μ A	240 Vac, 60 Hz		2 Typ.	2.5 Max.
Switching frequency, kHz		225 Min.	250 Typ.	285 Max.
Clearance/creepage, mm		8 Min.		

Environmental Specifications

Operating ambient temperature, $^{\circ}$ C	With derating	-40 Min.		+105 Max.
Maximum case temperature, $^{\circ}$ C				+105 Max.
Over temperature protection $^{\circ}$ C			115 Typ.	
Storage temperature range, $^{\circ}$ C		-55 Min.		125 Max.
Thermal impedance			14.36 Typ.	
Operating altitude, m				5000 Max.
Thermal shock		MIL-STD-810-F		
Vibration		MIL-STD-810-F		
Relative humidity		5% to 95% RH		

Physical Specifications

Design meet safety standard	IEC/EN/ANSI/AAMI ES 60601-1, UL:E360199 IEC/EN/UL 60950-1, 62368-1, UL:E193009, CB:UL(Demko)
Case material	Non-conductive black plastic
Base material	Non-conductive black plastic
Potting material	Silicone, (UL94 V-0)
Dimensions	1.0" \times 1.6" \times 0.4" (25.4 \times 40.6 \times 10.2 mm)
Weight	24g (0.85oz)
MTBF	1.712 \times 10 ⁶ hrs , MIL-HDBK-217F, Full load

EMC Specifications

Specifications	Conditions	Level
EMI	EN55011, EN55032 and FCC Part 18	Without external components Class A
		With external components Class B
ESD	EN61000-4-2	Air \pm 15KV and Contact \pm 8KV Perf. Criteria A
Radiated immunity	EN61000-4-3	10V/m Perf. Criteria A
Fast transient ⁽¹⁾	EN61000-4-4	\pm 2KV Perf. Criteria A
Surge ⁽¹⁾	EN61000-4-5	\pm 2KV Perf. Criteria A
Conducted immunity	EN61000-4-6	10 Vr.m.s Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second Perf. Criteria A

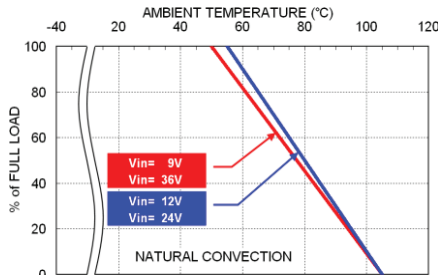
Note:

- The CWA20-12XXX/ CWB20-12XXX recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220 μ F/100V) and a TVS (SMDJ36A, 36V, 3000Watt peak pulse power) to connect in parallel.
The CWA20-12XXX/ CWB20-12XXX recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220 μ F/100V) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) to connect in parallel.
The CWA20-12XXX/ CWB20-12XXX recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220 μ F/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.
- For further information, please contact Polytron Devices.

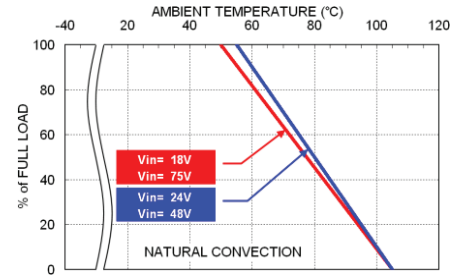
CAUTION: This power module is not internally fused. An input line fuse must always be used.

CWA20 AND CWB20 SERIES

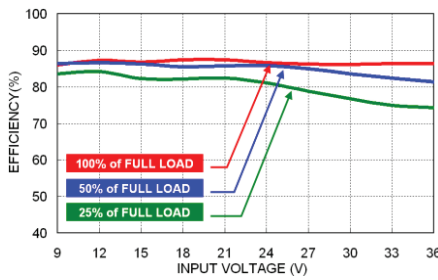
Characteristic Curve



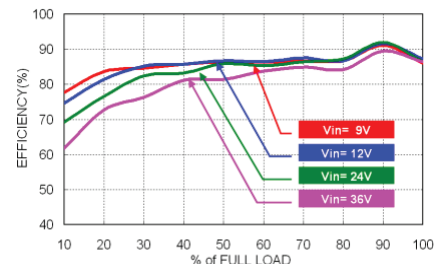
CWB20-24SXX Derating Curve



CWB20-48SXX Derating Curve



CWB20-24S5 Efficiency vs. Input Voltage



CWB20-24S5 Efficiency vs. Output Load

Fuse Consideration

Modules	Fuse Rating (A)	Fuse Type
CPA20-12XX, CPB20-24SXX	4	Slow-Blow
CPA20-24XX, CPB20-48SXX	2	Slow-Blow
CPA20-48XX	1	Slow-Blow

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

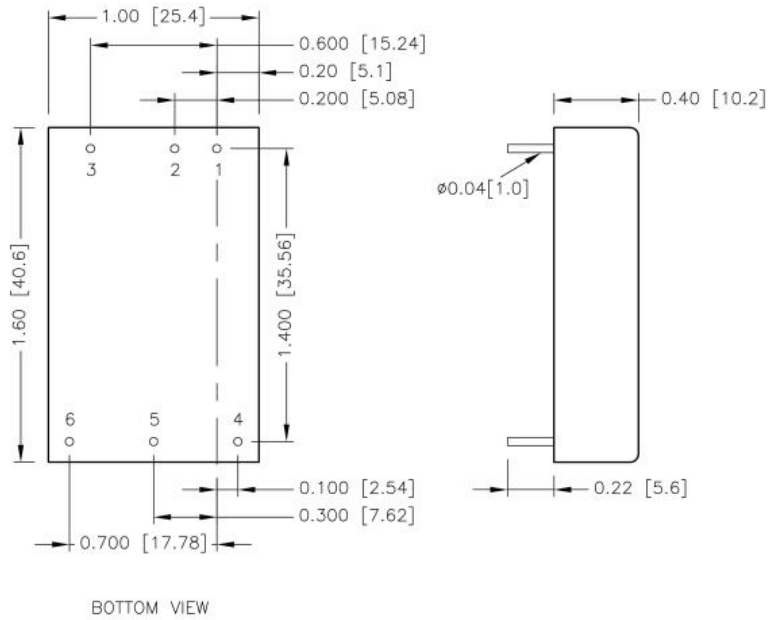
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system production, always use an input line fuse.

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

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

CWA20 AND CWB20 SERIES

Mechanical Drawing

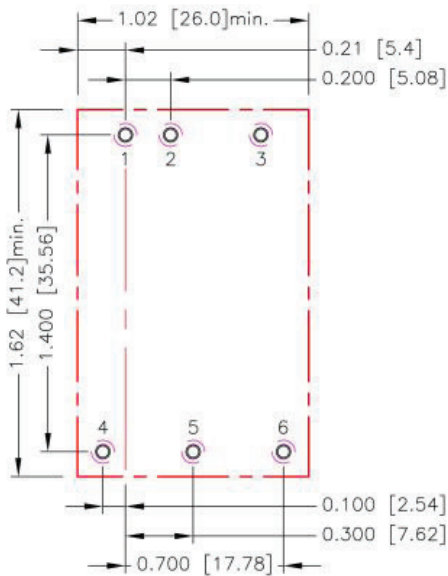


PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	Ctrl (Option)	Ctrl (Option)
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)
3. Pin dimension tolerance ±0.004(0.10)

Recommended Pad Layout



1. All dimensions in inch (mm)
2. Pad Size (lead free recommended)
3. Through hole 1.2.3.4.5.6: $\varnothing 0.051(1.30)$
4. Top view pad 1.2.3.4.5.6: $\varnothing 0.064(1.63)$
5. Bottom view pad 1.2.3.4.5.6: $\varnothing 0.102(2.60)$
6. There should be at least 8mm between primary and secondary circuit

CWA20 AND CWB20 SERIES

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.

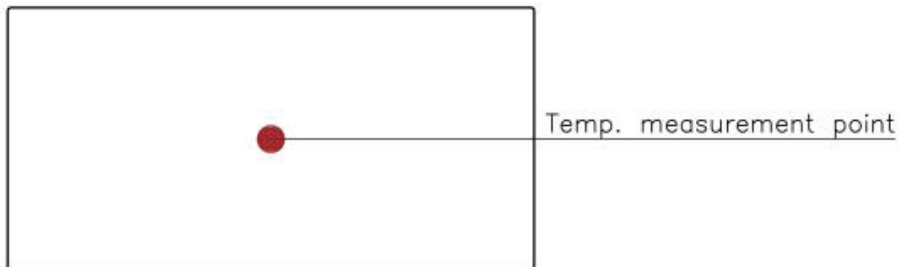
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

Thermal test condition with vertical direction by natural convection (20LFM)



Output Voltage Adjustment

It allows the user to increase or decrease the output voltage of the module.

This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins.

With an external resistor between the Trim and -Output pin, the output voltage increases.

With an external resistor between the Trim and +Output pin, the output voltage decreases.

The external Trim resistor needs to be at least 1/16 W of rated power.

TRIM UP EQUATION:

$$R_U = \left[\frac{G \times L}{(V_{O,up} - L - K)} - H \right] \Omega$$

TRIM DOWN EQUATION:

$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

TRIM CONSTANTS:

MODULE	G	H	K	L
CWA20-XXS5, CWB20-XXS5	5110	2050	2.5	2.5
CWA20-XXS12, CWB20-XXS12	10000	5110	9.5	2.5
CWA20-XXS15, CWB20-XXS15	10000	5110	12.5	2.5
CWA20-XXS24, CWB20-XXS24	56000	13000	21.5	2.5

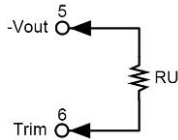
CWA20 AND CWB20 SERIES

Output Voltage Adjustment (continued)

EXTERNAL OUTPUT TRIMMING:

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

TRIM-UP:



CWA20-XXS5		CWB20-XXS5									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		5.05	5.1	5.15	5.2	5.25	5.3	5.35	5.4	5.45	5.5
RU (k Ω)		253.450	125.700	83.117	61.825	49.050	40.533	34.450	29.888	26.339	23.500

CWA20-XXS12		CWB20-XXS12									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		12.12	12.24	12.36	12.48	12.6	12.72	12.84	12.96	13.08	13.2
RU (k Ω)		203.223	99.057	64.334	46.973	36.557	29.612	24.652	20.932	18.038	15.723

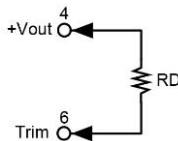
CWA20-XXS15		CWB20-XXS15									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		15.15	15.3	15.45	15.6	15.75	15.9	16.05	16.2	16.35	16.5
RU (k Ω)		161.557	78.223	50.446	36.557	28.223	22.668	18.700	15.723	13.409	11.557

ΔV (%)		11	12	13	14	15	16	17	18	19	20
Vout (V)		16.65	16.8	16.95	17.1	17.25	17.4	17.55	17.7	17.85	18
RU (k Ω)		10.042	8.779	7.711	6.795	6.001	5.307	4.694	4.149	3.662	3.223

CWA20-XXS24		CWB20-XXS24									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		24.24	24.48	24.72	24.96	25.2	25.44	25.68	25.92	26.16	26.4
RU (k Ω)		570.333	278.667	181.444	132.833	103.667	84.222	70.333	59.917	51.815	45.333

ΔV (%)		11	12	13	14	15	16	17	18	19	20
Vout (V)		26.64	26.88	27.12	27.36	27.6	27.84	28.08	28.32	28.56	28.8
RU (k Ω)		40.030	35.611	31.872	28.667	25.889	23.458	21.314	19.407	17.702	16.167

TRIM-DOWN:



CWA20-XXS5		CWB20-XXS5									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		4.95	4.9	4.85	4.8	4.75	4.7	4.65	4.6	4.55	4.5
RD (k Ω)		248.340	120.590	78.007	56.715	43.940	35.423	29.340	24.778	21.229	18.390

CWA20-XXS12		CWB20-XXS12									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		11.88	11.76	11.64	11.52	11.4	11.28	11.16	11.04	10.92	10.8
RD (k Ω)		776.557	380.723	248.779	182.807	143.223	116.834	97.985	83.848	72.853	64.057

CWA20-XXS15		CWB20-XXS15									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		14.85	14.7	14.55	14.4	14.25	14.1	13.95	13.8	13.65	13.5
RD (k Ω)		818.223	401.557	262.668	193.223	151.557	123.779	103.938	89.057	77.483	68.223

CWA20-XXS24		CWB20-XXS24									
ΔV (%)		1	2	3	4	5	6	7	8	9	10
Vout (V)		23.76	23.52	23.28	23.04	22.8	22.56	22.32	22.08	21.84	21.6
RD (k Ω)		4947.667	2439.333	1603.222	1185.167	934.333	767.111	647.667	558.083	488.407	432.667