AC/DC 200W Open Frame Power Supply

LOF200-20BxxR2 Series

MORNSUN®

RoHS

FEATURES

- Input voltage range: 80 - 264VAC/110 - 370VDC
- Compact size: 4" x 2" x 1"
- Operating ambient temperature range: -40℃ to +85℃
- Active PFC
- High I/O isolation test voltage up to 4000VAC
- Operating altitude up to 5000m
- Very low leakage current ＜0.1mA
- Stand-by power consumption 0.5W Typ.
- 150% peak load output for 3S
- The base plate with conformal coating
- Output short circuit, over-current, over-voltage, over-temperature protection
- Design to meet medical approvals and be suitable for BF type applications
- 3 years warranty
- Installing in system of Safety Class I/II is available
- Safety according to IEC/EN/UL/BS EN62368-1, GB4943.1, IEC/EN60335-1, IEC/EN61558-1, IEC/EN/ES60601-1

LOF200-20BxxR2 series is one of Mornsun's AC-DC miniaturize open frame power supply and suitable for all kinds of BF type (be accessible to patients) medical system equipment. It features universal AC input and at the same time accepts DC input voltage, cost-effective, high efficiency, high reliability and double or reinforced insulation. These converters offer excellent EMC and safety performance, which meet IEC/EN/UL/BS EN62368, GB4943, IEC/EN60335, IEC/EN61558, IEC/EN/ES60601 standards and they are widely used in areas of industrial, LED, street light control, security, telecommunications, smart home, medical, etc.

Selection Guide

Certification	Part No.	Cool Mode	Output Power (W)*	Nominal Output Voltage and Current (Vo/Io)	Output Voltage Adjustable Range (V)	Instantaneous Power (W) /Duration (S)	Peak Current (A)	Efficiency at 230VAC (%) Typ.*	Max. Capacitive Load (μF)
--	LOF200-20B12R2	Air cooling	140.4	12V/11.7A	11.4-12.6	300/3	25.0	93	3000
		10.98CFM	200.4	12V/16.7A					
	LOF200-20B15R2	Air cooling	141.0	15V/9.4A	14.3-15.8		20.0	93	2600
		10.98CFM	201.0	15V/13.4A					
	LOF200-20B19R2	Air cooling	142.5	19V/7.5A	17.1-20.0		15.9	93.5	2200
		10.98CFM	201.4	19V/10.6A					
	LOF200-20B24R2	Air cooling	141.6	24V/5.9A	22.8-25.2		12.5	94	1600
		10.98CFM	201.6	24V/8.4A					
	LOF200-20B27R2	Air cooling	143.1	27V/5.3A	25.6-29.0		11.1	94	1300
		10.98CFM	202.5	27V/7.5A					
	LOF200-20B36R2	Air cooling	140.4	36V/3.9A	34.2-37.8		8.3	94	1100
		10.98CFM	201.6	36V/5.6A					
	LOF200-20B48R2	Air cooling	144.0	48V/3.0A	45.6-50.4		6.3	94	1000
		10.98CFM	201.6	48V/4.2A					
	LOF200-20B54R2	Air cooling	145.8	54V/2.7A	52.0-58.0		5.6	94	700
		10.98CFM	205.2	54V/3.8A					

Note: 1.*Under any conditions, the total power of the product should not exceed the rated power. When the output voltage is increased, the total output power cannot exceed the rated output power, when the output voltage is decreased, the output current cannot exceed the rated output current;
2.*When measuring the full load efficiency, the fan should be connected to an external power supply, fan loss is not included in the input power.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	Rated input (Certified voltage)		100	--	240	VAC
	AC input		80	--	264	
	DC input		110	--	370	VDC
Input Voltage Frequency	Rated input (Certified voltage)		--	50/60	--	Hz
	AC input		47	--	63	
Input Current	Rated input (Certified voltage)		--	--	2.5	A
	115VAC		--	--	2.5	
	230VAC		--	--	1	
Inrush Current	115VAC	Cold start	--	40	--	
	230VAC		--	80	--	
Power Factor	115VAC		--	0.98	--	--
	230VAC		--	0.95	--	
Start-up Delay Time	115VAC/230VAC, rated load		--	1000	--	ms
Input Fuse	Built-in fuse		--	6.3	--	A
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy*	Full load range		--	±3	--	%
Line Regulation	Rated load		--	±0.5	--	
Load Regulation	0% - 100% load		--	±1	--	
Minimum Load			0	--	--	
Stand-by Power Consumption			--	0.5	--	W
Ripple & Noise*	20MHz bandwidth (peak-peak value)	12V	--	--	120	mV
		15V	--	--	150	
		19V	--	--	190	
		24/27V	--	--	200	
		36/48/54V	--	--	250	
Temperature Coefficient			--	±0.03	--	%/℃
Hold-up Time	230VAC, rated load, 25℃	Air cooling	--	16	--	ms
		10.98CFM	--	8	--	
Short Circuit Protection	Recovery time <30s after the short circuit disappear.		Hiccup, continuous, self-recover			
Over-current Protection	230VAC, rated load	Normal temperature, high temperature	⩾105% Io, hiccup, self-recover			
		Low temperature	⩾105% full load after derating, hiccup, self-recover			
Over-voltage Protection	12V		⩽16VDC (Hiccup, self-recover)			
	15V		⩽20VDC (Hiccup, self-recover)			
	19V		⩽25VDC (Hiccup, self-recover)			
	24V		⩽32VDC (Hiccup, self-recover)			
	27V		⩽35VDC (Hiccup, self-recover)			
	36V		⩽47VDC (Hiccup, self-recover)			
	48V		⩽60VDC (Hiccup, self-recover)			
	54V		⩽63VDC (Hiccup, self-recover)			
Over-temperature Protection	230VAC, 100% load	Over-temperature protection start	--	80	--	℃
		Over-temperature protection release	--	65	--	
Fan power	12/15/19/24/27/36/48/54V		Provide 12V/0.5A output for the fan, with			

		voltage accuracy of ±15% under the premise that the main output is greater than 20% of the rated load

Notes:
1. *Output voltage accuracy: including the setting error, line regulation, load regulation.
2. *The "Tip and barrel method" is used for ripple and noise test, output parallel 47uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information.
3. *For all the above test items, please refer to our company standard "AC-DC Black Box Test Specification" for specific test specifications and methods.

General Specifications

Item		Operating Conditions			Min.	Typ.	Max.	Unit
Isolation Test	Input - output	Electric strength test for 1min., leakage current <5mA			4000	--	--	VAC
	Input - ⏚				2000	--	--	
	Output - ⏚				1500	--	--	
Insulation Resistance	Input - ⏚	Ambient temperature: 25 ± 5℃ Relative humidity: < 95%RH, no condensation Test voltage: 500VDC			100	--	--	MΩ
	Input - output				100	--	--	
	Output - ⏚				100	--	--	
Operating Temperature					-40	--	+85	℃
Storage Temperature					-40	--	+85	
Storage Humidity		No condensation			10	--	95	%RH
Operating Humidity					20	--	90	
Switching Frequency		PFC			--	65	--	KHz
		DC-DC			--	85	--	
Power Derating		Operating temperature derating	Air cooling (140W)	-40℃ to -36℃	10	--	--	%/℃
				115VAC -36℃ to +45℃	0	--	--	
				115VAC +45℃ to +70℃	1.2	--	--	
				230VAC -36℃ to +50℃	0	--	--	
				230VAC +50℃ to +60℃	2.5	--	--	
				230VAC +60℃ to +70℃	0.5	--	--	
			10.98CFM (200W)	-40℃ to -35℃	10	--	--	
				-35℃ to -30℃	4	--	--	
				-30℃ to +50℃	0	--	--	
				+50℃ to +85℃	1.83	--	--	
		Input voltage derating	80VAC-115VAC		0.86	--	--	%/VAC
			115VAC-264VAC		0	--	--	
			110VDC-160VDC		0.6	--	--	%/VDC
		Altitude derating	2000 - 5000m		5	--	--	%/Km
Leakage Current		240VAC, 60Hz	Touch current		<0.1mA			
Safety Standard					Design refer to IEC/EN/UL/BS EN62368-1, GB4943.1, IEC/EN60335-1, IEC/EN61558-1, IEC/EN/ES60601-1			
Safety Class					CLASS I (with PE and must be connected)/CLASS II (without PE)			
MTBF		MIL-HDBK-217F@25℃			≥300,000 h			
Warranty		Ambient temperature: <50℃			3 years			

Environmental Characteristics

Item	Operating Conditions	Standard
High and Low Temperature Working	+85℃, -40℃	GB2423.1, IEC60068-2-1
Sinusoidal Vibration	10 - 500Hz, 2g, three directions of X, Y, Z axis	GB2423.10, IEC60068-2-6
Low Temperature Storage	-40℃	GB2423.1, IEC60068-2-1
High Temperature Storage	+85℃	GB2423.2, IEC60068-2-2

High Temperature Aging	+50℃	GB2423.2, IEC60068-2-2
Normal Temperature Aging	+25℃	GB2423.1, IEC60068-2-1
Temperature Shock	-40℃ to +85℃	GB2423.22, IEC60068-2-14
Temperature Cycle	-25℃ to +60℃	GB2423.22, IEC60068-2-14
Hot and Humid	+85℃, 85%RH	GB2423.50, IEC60068-2-67
High Temperature Elevation	+50℃, 54KPa	GB2423.26, IEC60068-2-41
Low Temperature Elevation	-25℃, 54KPa	GB2423.25, IEC60068-2-40
Sinusoidal Vibration Response	10 - 150Hz, 1g, three directions of X, Y, Z axis	GB/T 11287-2000, IEC60255-21-1
Sinusoidal Vibration Endurance Test		
Sinusoidal Impulse Response	15g, pulse duration 11ms, three times in each direction of X, Y, Z axis	GB/T 114537-1993, IEC60255-21-2
Sinusoidal Impact Endurance Test		
Packaging Drop	1m, one corner, three edges and six sides	GB2423.8, IEC68-2-32

Mechanical Specifications

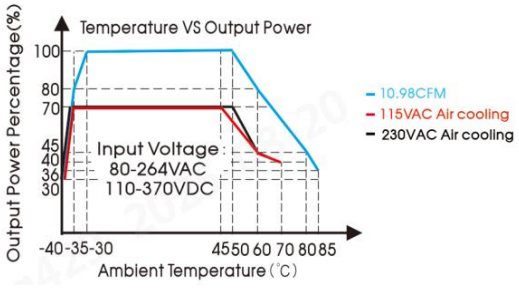
Case Material	Open frame
Dimension	101.60mm x 50.80mm x 25.40mm
Weight	190g (Typ.)
Cooling Method	Air cooling (140W) /10.98CFM (200W)

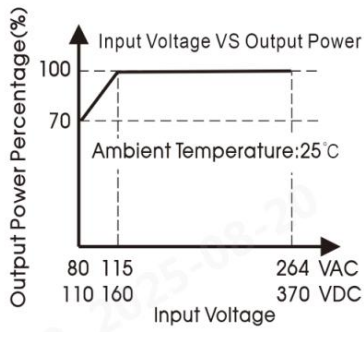
Electromagnetic Compatibility (EMC)

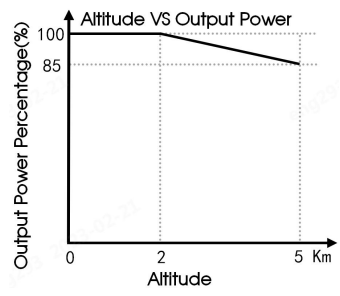
Emissions*	CE	CISPR32/EN55032 (CLASS I equipment, CLASS B; CLASS II equipment, CLASS A)		
	RE	CISPR32/EN55032 (CLASS I equipment, CLASS B; CLASS II equipment, CLASS A)		
	Harmonic current	IEC/EN61000-3-2 CLASS A and CLASS D		
Immunity*	ESD	IEC/EN 61000-4-2	Contact ±8KV/Air ±15KV	perf. Criteria A
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	±4KV	perf. Criteria A
	Surge	IEC/EN 61000-4-5	±2KV/±4KV	perf. Criteria A
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A
	PFMF	IEC/EN61000-4-8	30A/m	perf. Criteria A
	Voltage short interruptions	IEC/EN61000-4-11	0% of 230Vac, 0Vac, 1 cycle	perf. Criteria B
			40% of 230Vac, 92Vac, 10/12 cycle	perf. Criteria B
			70% of 230Vac, 161Vac, 25/30 cycle	perf. Criteria B
	Voltage variations	IEC/EN61000-4-11	0% of 230Vac, 0Vac, 250/300 cycle	perf. Criteria C

Note: 1. *perf. Criteria:
A: The equipment shall continue to operate as intended without operator intervention;
B: After the test, the equipment shall continue to operate as intended without operator intervention;
C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.
2.*The power supply should be considered as a part of the components in the system. All EMC performance are been tested on a metal plate with a thickness of 1mm and a length of 360mm x 360mm. The power supply must be combined with the terminal equipment for electromagnetic compatibility confirmation.
3.*Category I products with PE (which must be connected), category II products without PE.

Product Characteristic Curve

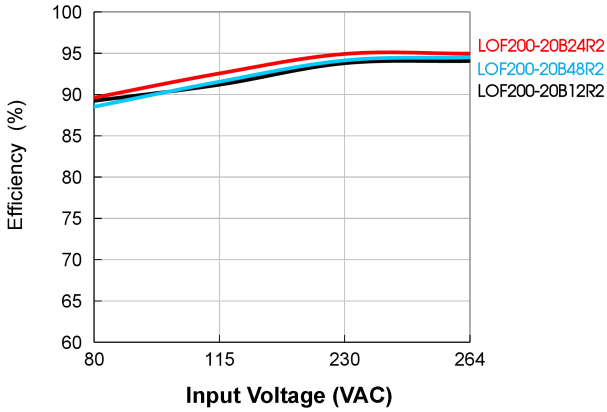




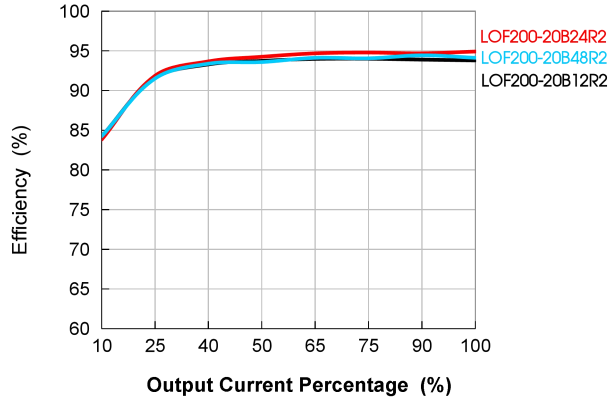


Note: 1. With an AC input voltage between 80 -115VAC and a DC input between 110-160VDC the output power must be derated as per the temperature derating curves.
2. This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.

Efficiency Vs Input Voltage (Full Load)

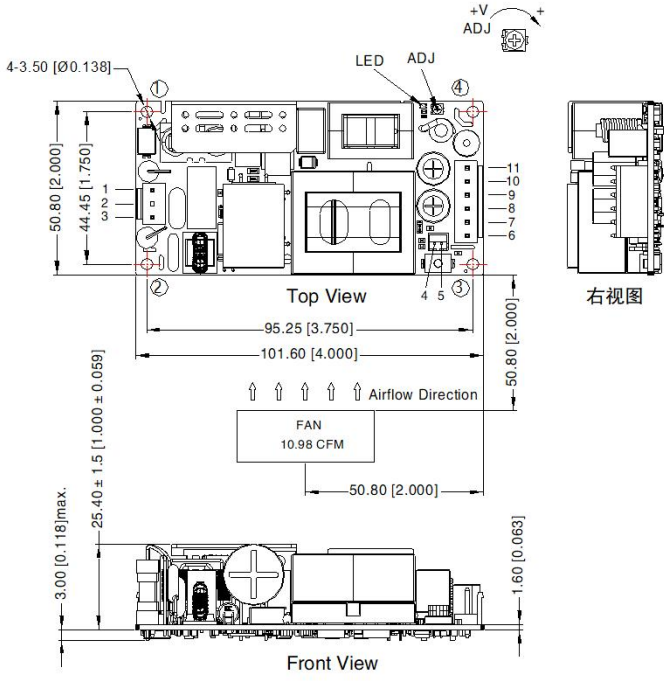


Efficiency Vs Output Load (Vin=230VAC)



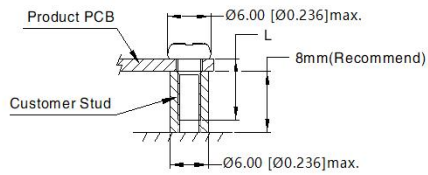
Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Pin-Out			
Pin	Mark	Product Connector	Customer Connector
1	AC(N)/DC-	JST B3P-VH or equivalent	Housing: JST VHR Terminal: JST SVH-21T-P1.1 or equivalent
2	NC		
3	AC(L)/DC+		
4	Fan-	JST B2B-PH-K-S or equivalent	Housing: JST PHR-2 Terminal: JST SPH-002T-P0.5S or equivalent
5	Fan+		
6、7、8	-Vo	JST B6P-VH or equivalent	Housing: JST VHR Terminal: JST SVH-21T-P1.1 or equivalent
9、10、11	+Vo		

Position	Screw Spec.	L(Recommend)	Torque
①－④	M3	6mm	0.4 ± 0.04N•m



Note:
1. Unit: mm[inch]
2. ADJ: Output adjustable resistor
3. General tolerances: ± 1.00[± 0.039]
4. Do not use fan power to power other devices
5. The layout of the device is for reference only, please refer to the actual product
6. Reserved safety distance between PCB edge and customer components, recommended 10mm
7. Class Ⅰ system ①, ③ positions must be connected to the earth(⏚)
8. Class Ⅱ system ①, ③ positions must be connected together

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220192;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity <75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. In order to improve the efficiency at high input voltage, there will be audible noise generated, but it does not affect product performance and reliability;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
8. The output voltage can be adjusted by the ADJ, clockwise to increase;
9. CAUTION: Double pole, neutral fusing. Disconnect mains before servicing."/"ATTENTION: Double pôle/fusible sur le neutre. Débrancher lalimentation avant lentretien;
10. The power supply is considered a component which will be installed into a terminal equipment. All EMC tests should be confirmed with the final equipment. Please consult our FAE for EMC test operation instructions.
11. When the output voltage is adjusted via the ADJ exceeds the upper adjustable limit specified in the manual, the product may trigger over-power protection. It will automatically recover after being adjusted back within the specified range.
12. The surface of product should keep a safe distance from the customer system (recommended ≥3mm), if not, please consult Mornsun FAE.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 8 Nanyun 4th Road, Huangpu District, Guangzhou, China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com