

Embedded Switch Mode Power Supplies (SMPS)

FEATURES

- Universal 90 - 264V AC Active PFC
- Compact size: 5" × 3" × 1"
- Efficiency up to 94%
- Stand-by power consumption. < 0.5W
- Operating temperature range - 40°C to +70°C
- Conformally coated PCB
- Low leakage current < 0.1mA
- Output short circuit, over-current, over-voltage protection.
- EMI performance meets. CISPR32 / EN55032 CLASS B
- Medical and Industrial safety approvals. Suitable for BF application

IEC/EN/UL62368-1,
IEC/EN60335-1,
IEC/EN61558-1, GB4943-1,
IEC/EN/ES60601-1 (2 × MOPP)

RS PRO Embedded Switch Mode Power Supplies

- 233-6888
- 233-6891
- 233-6893



RS Professionally Approved Products bring to you professional quality parts across all product categories. Our product range has been tested by engineers and provides a comparable quality to the leading brands without paying a premium price.

Embedded Switch Mode Power Supplies (SMPS)

Product Description

AC-DC open frame power supply suitable for a wide range of Industrial, Medical and Dental applications. Featuring a universal AC input this cost-effective, high density design is available in a range of standard outputs. Complying with International and European EMC and safety standards IEC/EN/UL62368, GB4943, IEC/EN60335, IEC/EN61558, IEC/EN/ES60601

General Specifications

Model	AC-DC 350W Medical / Industrial power supply
Mounting Type	Chassis Mount
MTBF	MIL-HDBK-217F@25°C > 300,000 h
Applications	Industrial control systems, instrumentation and medical equipment

RS Stock#	Input Voltage	Output Voltage	Adj'range (V)	Output Current	Wattage	Efficiency (Typ)
233-6888	90 to 264V ac 127 to 370V dc	12V DC	11.4-12.6	15A (Free air)	180W	92%
				25A (20.5CFM)	300W	
233-6891	90 to 264V ac 127 to 370V dc	24V DC	22.8-25.2	8.33A (Free air)	199W	93%
				14.6A (20.5CFM)	350W	
233-6893	90 to 264V ac 127 to 370V dc	48V DC	45.6-50.4	4.17A (Free air)	200W	94%
				7.3A (20.5CFM)	350W	

Input Specifications

Input Specification	
Voltage Range	90 to 264V ac, 127 to 370V dc
Frequency	47 to 63Hz
AC Current Rating	4A/115V ac, 2A/230V ac
Inrush Current	50A/ 115V ac, 75A / 230V ac
Leakage	<0.1mA, single fault <0.5mA
Power Factor	0.98 115Vac, 0.95 230Vac
Standby power consumption	0.5W

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Output Specifications

Output Specification	233-6888	233-6891	233-6893
Output voltage	12V	24V	48V
Adjustment range	11.4-12.6V	22.8-25.2V	45.6-50.4V
Rated Current (20.5CFM)	25A	14.6A	7.3A
Ripple & Noise (max.) *	120mVp-p	150mVpp	250mVpp
Rated Power (20.5CFM)	300W	350W	350W
Line Regulation typ.	±0.5%	±0.5%	±0.5%
Load Regulation typ.	±1%	±1%	±1%
Max Capacitive load μ F	6000 μ F	3200 μ F	2000 μ F
Minimum Load	0%	0%	0%
Fan Power	12V 0.5A with output voltage accuracy \pm 15%		

Hold Up Time	14ms/230V ac
Over Voltage Protection	12V output \leq 15V (Output voltage turn off, re-power on for recover) 24V output \leq 30V (Output voltage turn off, re-power on for recover) 48V output \leq 59.5V (Output voltage turn off, re-power on for recover)
Over-current Protection	\geq 110% I_o , Constant current, continuous, self-recover
Short Circuit Protection	Constant current, continuous, self-recover
Isolation	4KVAC

Notes: 1. * Output Voltage Accuracy: including setting error, line regulation, load regulation; 2.* The "Tip and barrel method" is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information; 3. * When the product works under light load (\leq 10% I_o), in order to improve efficiency, the value of ripple & noise will be 1.5 times of the full load specification; 4.* For all the above test items, please refer to our company standard "AC-DC Black Box Test Specification" for specific test specifications and methods; 5.* For fan power connection method, please refer to pin 6/7 of the dimension drawing.

Embedded Switch Mode Power Supplies (SMPS)

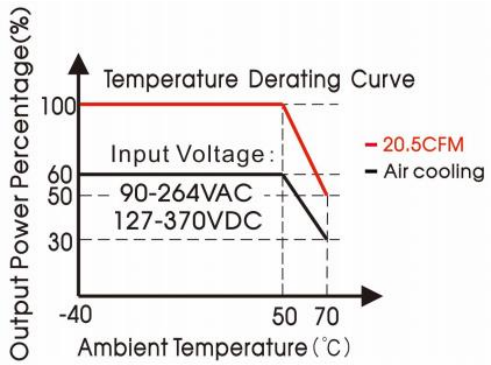
General Specifications

Item	Operating Conditions		Min	Typ	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1min, leakage current <10mA	4000	-	-	VAC
	Input-Earth	Electric Strength Test for 1min, leakage current <10mA	2000	-	-	
	Output-Earth	Electric Strength Test for 1min, leakage current <5mA	1500	-	-	
Insulation Resistance	Input-Earth	500VDC, 25±5 °C,	100	-	-	MΩ
	Input-output	Humidity < 95%RH, non-condensing	100	-	-	
	Output-Earth	500VDC	100	-	-	
Isolation level	Input-output		2 × MOPP			
	Input-Earth		1 × MOPP			
	Output-Earth		1 × MOPP			
Operating Temperature		-40	-	+70	°C	
Storage Temperature		-40	-	+85		
Storage Humidity	Non-condensing		10	-	95	%RH
Operating Humidity			20		90	
Power Derating	Operating temperature derating	+50 °C to +70 °C	2.5	-	-	% / °C
		-40 °C to 50 °C	0	-	-	
	Input voltage derating	90VAC - 100VAC	1.0	-	-	% / VAC
		100VAC - 264VAC	0	-	-	
Safety Standard		Meet IEC/EN/UL62368-1/EN60335-1 IEC/EN61558-1 /GB4943-1 IEC/EN60601-1/ES60601-1(3.1 version) CAN/CSA-C22.2 No.60601-1:14- Edition 3 EN60601-1-2 Edition 4				
Safety Certification		IEC/EN/UL62368-1 EN60335/EN61558/ EN/ES60601				
Safety Class		CLASS I (PE and must be connected)				
MTBF	MIL-HDBK-217F@25°C	> 300,000 h				

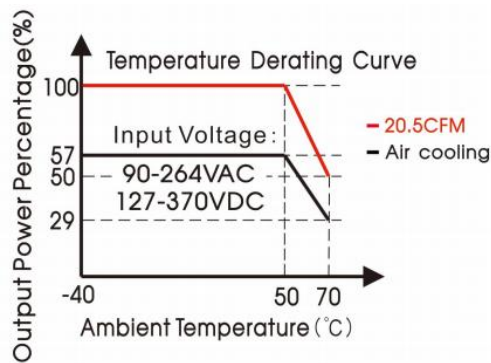
Embedded Switch Mode Power Supplies (SMPS)

Derating

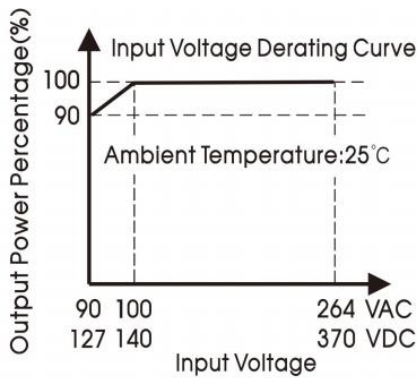
LOF350-20B12 (full load 300W with Forced Air)



LOF350-20B24/48 (full load 350W with Forced Air)



LOF350-20Bxx Input Voltage Derating Curve



EMC Specifications

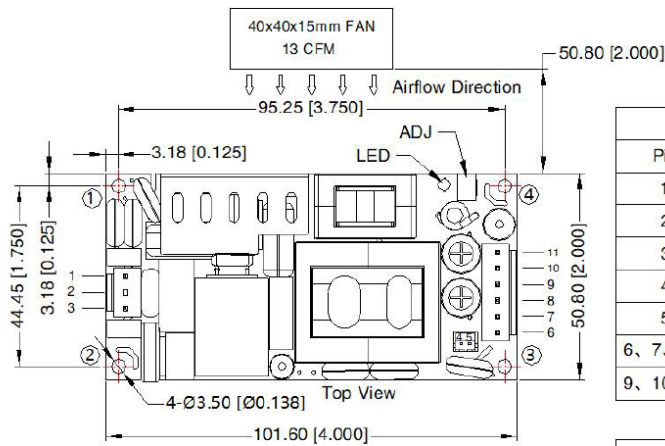
Emissions	CE	CISPR32/EN55032 CLASS B	
	RE	CISPR32/EN55032 CLASS B	
	Harmonic Current	IEC/EN61000-3-2 CLASS D	
	Flicker	IEC/EN61000-3-3	
Immunity	ESD	IEC/EN 61000-4-2 Contact $\pm 8\text{KV}$ /Air $\pm 15\text{KV}$	Perf. Criteria A
	RS	IEC/EN 61000-4-3 10V/m	Perf. Criteria A
	EFT	IEC/EN 61000-4-4 $\pm 4\text{KV}$	Perf. Criteria A
	Surge	EC/EN 61000-4-5 $\pm 2\text{KV}/\pm 4\text{KV}$	Perf. Criteria A
	CS	IEC/EN61000-4-6 10 Vr.m.s	Perf. Criteria A
	DIP	IEC/EN61000-4-11 0%, 70%	Perf. Criteria B
<p>Notes: 1.*The power supply is considered a component as part of system, all EMC items are tested on a metal plate (L x W x H, 360mm x 360mm x 1mm). Power supply should be combined with final equipment for EMC confirmation; 2.*Category I products with PE.</p>			

Mechanical Specifications

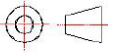
Case Material	Open Frame
Dimensions	127 x 76.2 x 25.4mm
Weight	295g (Typ.)
Cooling Method	Air cooling 180-200W / 20.5CFM 300-350W

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Dimensions and recommended layout

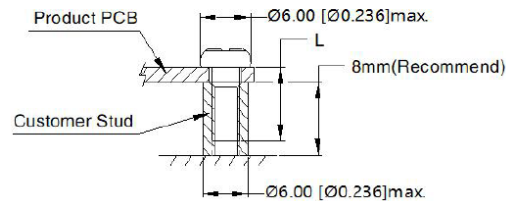
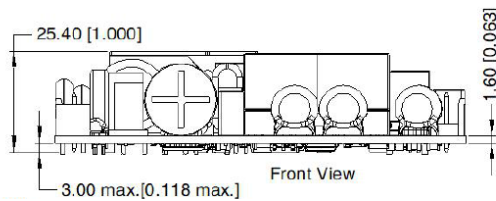


THIRD ANGLE PROJECTION



Pin-Out			
Pin	Function	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+	JST B3P-VH or equivalent	Housing: JST VHR Terminal: JST SVH-21T-P1.1 or equivalent
4	Fan-	JST B2B-PH-K-S or equivalent	Housing: JST PHR-2 Terminal: JST SPH-002T-P0.5S or equivalent
5	Fan+	JST B2B-PH-K-S or equivalent	Housing: JST PHR-2 Terminal: JST SPH-002T-P0.5S or equivalent
6, 7, 8	-Vo	JST B6P-VH or equivalent	Housing: JST VHR Terminal: JST SVH-21T-P1.1 or equivalent
9, 10, 11	+Vo	JST B6P-VH or equivalent	Housing: JST VHR Terminal: JST SVH-21T-P1.1 or equivalent

Position	Screw Spec.	L(Recommend)	Torque(max)
① - ④	M3	6mm	0.4N·m



Note:

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

Approvals

Safety Standard	IEC/EN/UL62368-1, EN60335-1, IEC/EN61558-1, GB4943-1, IEC/EN60601-1, ES60601-1(3.1 version), CAN/CSA-C22.2 No.60601-1:14-Edition 3, EN60601-1-2 Edition 4
Safety Certification	IEC/EN/UL62368-1, UL/EN60601
Safety Class	Class I (PE and must be connected)

Note:

1. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated output load.
2. All index testing methods in this datasheet are based on our company corporate standards.
3. 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.
4. Products are related to laws and regulations: see "Features" and "EMC".
5. Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.
6. CAUTION: Double pole, neutral fusing. Disconnect mains before servicing."/"/ ATTENTION: Double pôle/fusible sur le neutre. Débrancher l'alimentation avant l'entretien;
7. The power supply is considered a component which will be installed into a terminal.