

## DESCRIPTION

The SFA160 is a series of high efficiency, small form factor and single output AC-DC power supplies.

Offering 160 W of regulated DC power from an open frame 2 x 4 x 1" standard form factor, the SFA160 series require less space in a system, enabling designers to offer smaller systems or to integrate more advanced features into them without compromising on their size.

By converting energy at 91% typical efficiency, the SFA160 series generate less heat facilitating thermal management and enhancing reliability and life time.

The SFA160 series is available in four different output voltages at 5, 12, 24 and 48 V and is equipped with an auxiliary low power 12 V output which can be used as the supply voltage for an external fan.

The SFA160 series comply with the 2<sup>nd</sup> edition of the IEC/EN 60950-1 and CAN/CSA 60950-1 safety standards for IT equipment. The series meets the EN 55022 EMC limits of Class B for conducted and Class A for radiated emissions as well as the IEC/EN 61000-3 and IEC/EN 61000-4 EMC standards.



## KEY FEATURES

- Universal input voltage range
- 160 W, active PFC power supply
- Very small form factor (2 x 4 x 1) in
- High efficiency (91% typical)
- 5, 12, 24 and 48V standard output variants
- Over temperature protection
- Output over-voltage protection
- Over current and short circuit protections
- Auxiliary fan +12 V output
- 4000 m altitude operation (Class II version)
- IEC/EN 60950-1, CAN/CSA 60950-1, 2<sup>nd</sup> ed.
- RoHS-6 compliant (EU directive 2011/65/EU)

## TARGET APPLICATIONS

Networking and Communications Equipment  
DSL, Wi-Fi and WiMax Base-stations  
Video and Broadcast Equipment  
Audio, Music and Radio Industries

Industrial Computers  
LED Industrial Displays, Monitors  
Automation, Drives, Industrial Controls  
Test/Masurement Equipment

## MODELS AND OUTPUT SPECIFICATIONS

Model Number	V1 [V]	I1 <sup>1</sup> Convection [A]	I1 <sup>1</sup> Forced air [A]	V1 <sup>2</sup> Ripple [mV]	V2 [V]	I2 <sup>1</sup> Rated [A]	V2 <sup>2</sup> Ripple [mV]
SFA160-US05	5	14.00	20.00	50	12	0.5	240
SFA160-US12	12	8.30	13.33	120	12	0.5	240
SFA160-US24	24	4.16	6.66	240	12	0.5	240
SFA160-US48	48	2.08	3.33	480	12	0.5	240

<sup>1</sup> The combined output power of V1 and V2 must not exceed 70 W for the 5V model or 100 W for the 12, 24 and 48 V when natural convection cooled, and 100 W and 160 W respectively when forced air cooled at 500 LFM, up to 50 °C ambient. Above 50 °C output de-rating applies (see details on the output specifications).

<sup>2</sup> Peak-to-Peak measured at 20 MHz Bandwidth.

## INPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
AC Input Voltage	PS starts and operates at 90 V <sub>AC</sub> at all load conditions	90	100/240	264	V <sub>AC</sub>
Input Frequency		47	50/60	63	Hz
DC Input Voltage		170	-	370	V <sub>DC</sub>
Input Current	RMS at 90 V <sub>AC</sub> , maximum load	-	-	2.3	A
Inrush Current	230 V <sub>AC</sub> , cold start, no damage	-	-	-	A
Fusing	2.5 A, Time Lag, 250 V on L and N	-	2.5	-	A
Efficiency	5V,	-	85	-	%
	12, 24, 48V, 115 V <sub>AC</sub>	-	90	-	
No load Power Consumption	12, 24, 48V, 230 V <sub>AC</sub>	-	91	-	W
	115 V <sub>AC</sub>	-	2.5	-	
Power Factor	230 V <sub>AC</sub>	-	2.3	-	W
	At full rated load,				
Harmonic Current Fluctuations and Flicker	115 V <sub>AC</sub> , 60 Hz	0.99	-	-	%
	230 V <sub>AC</sub> , 50 Hz	0.89	-	-	
Leakage Current	Complies with EN-61000-3-2 Class D at 230 V <sub>AC</sub> 50 Hz. Complies with EN-61000-3-3 at nominal voltages and full load.	-	-	250	μA

## OUTPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nom.	Max.	Units
V1 Set Point Accuracy			±1	-	%
V1 Output Power Rating	5V, natural convection	-	-	70	W
	5V, at 500 LFM forced air	-	-	100	
	12, 24, 48V, natural convection	-	-	100	
	12, 24, 48V, at 500 LFM forced air	-	-	160	
V2 Output Voltage	All models (15% accuracy)	10.2	12	13.8	V
V2 Output Current	All models	-	-	0.5	A
V1 Voltage Adjustment Range		-	-	±5	%V1
Load Regulation	V <sub>AC</sub> : nominal voltages				
	V1 Load: 0 – 100% rated V2 Load: 0 – 0.5 A	-	-	±1 ±5	%V1 %V2
Load-Line Cross Regulation	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>				
	V1: 0 – 100% load (V2 at 50% load) V2: 0 – 0.5 A load (V1 at 50% load)	-	-	±1 ±15	%V1 %V2
V1 Line Regulation	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>	-	-	±0.1	%V1
V1 Transient Response (Voltage Deviation)	50% load changes at 0.1 A/μs Recovery to regulation band within 1 ms	-	-	±5	%V1
V1 Ripple and Noise	All models, Peak-to-peak, 20 MHz BW. 470 pF ceramic and 22 μF tantalum caps at the load (resistive).	-	-	1	%V1
Start-up Rise Time	90 < V <sub>IN</sub> < 264, any load conditions.	0.2	-	20	ms
Start-up Delay	V1 in regulation after AC is applied	-	-	1000	ms
Turn-on Overshoot		-	10	-	%V1
		-	20	-	%V2
Hold-up Time	At nominal V <sub>IN</sub> , rated load, all models	16	-	-	ms
Minimum Load	All models; V1, V2	0	-	-	A
Temperature Drift		-	±0.25	-	mV/°C

## PROTECTION FEATURES

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
Input Fuse	Time Lag 2.5 A, 250 V, on L and N				
Over Current Short Circuit	Hiccup mode, auto-recovery	110	-	150	%I <sub>MAX</sub>
Over Voltage	Hiccup mode, auto-recovery	110	-	130	%V <sub>NOM</sub>
Over Temperature	Shut down, latch off mode				
I-O isolation	Shut-down, auto-recovery				
I-O isolation	Reinforced	4000	-	-	V <sub>AC</sub>
Isolation I-PE/O-GND		1500/500	-	-	V <sub>DC</sub>
Isolation V1-V2		100	-	-	V <sub>DC</sub>
Creepage and Clearance		8	-	-	mm



## ENVIRONMENTAL SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nominal	Max	Units
<b>Operating Temperature</b>	No de-rating up to 50 °C Linearly de-rate above 50 °C	-20	-	70	°C
<b>Storage Temperature Range</b>		-20	-	80	°C
<b>Humidity</b>	RH, Non-condensing Operating Non-operating	-	-	90 95	%
<b>Operating Altitude</b>	Class I version	-	-	3000	m
<b>Shock</b>	Operating: 10 g, 11 ms, half sine, one shock input in each axes				
<b>Vibration</b>	Operating, sinusoidal: 0.5 g peak-to-peak, 10-300 Hz, 3 axes				
<b>MTBF</b>	>235000 hours at 75% Full Load, Nominal V <sub>AC</sub> , 25 °C ambient MIL-HDBK-217-E-1.				
<b>Cooling</b>	Natural convection Forced air cooling	10 500	- -	- -	LFM

## ELECTROMAGNETIC COMPATIBILITY (EMC) - EMISSIONS

Phenomenon	Conditions / Notes	Standard	Equipment/Performance Class
<b>Conducted</b>	115 V <sub>RMS</sub> , 230 V <sub>RMS</sub> . Maximum load. 4 dB minimum margin	EN 55022	B
<b>Radiated</b>	At 10 m distance	EN 55022	A
<b>Line Voltage Fluctuation and Flicker</b>	At 20%, 50% and 100% maximum load. Nominal input voltages.	EN 61000-3-3	
<b>Harmonic Current Emission</b>	Nominal input voltages. All load conditions.	EN 61000-3-2	D

## ELECTROMAGNETIC COMPATIBILITY (EMC) - IMMUNITY

Phenomenon	Conditions / Notes	Standard	Test Level	Performance criteria
<b>ESD</b>	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
<b>Radiated Field</b>	3 V/m, 80-1000 MHz, 1 KHz/2 Hz 80% AM. Dwell time is 3 sec for 2 Hz modulation Dwell time is 1 sec for 1KHz modulation	EN 61000-4-3	3	A
<b>Electric Fast Transient</b>	±2 kV on AC power port for 1 minute; ±1 kV on signal/control lines	EN 61000-4-4	3	A
<b>Surge</b>	±1 kV line to line; ±2 kV line to earth; on AC power port; ±0.5 kV for outdoor cables	EN 61000-4-5	3	A B
<b>Conducted RF Immunity</b>	3 V <sub>RMS</sub> , 0,15-80 MHz, 1 KHz/2 Hz 80% AM	EN 61000-4-6	3	A
<b>Dips and Interruptions</b>	Dip to 40% for 5 cycles (100 ms) Dip to 70% for 25 cycles (500 ms) Drop-out to 5% for 10 ms Interrupts > 95% for 5 s	EN61000-4-11 EN61000-4-11 EN61000-4-11 EN61000-4-11		B B B C

## SAFETY AGENCIES APPROVAL

Certification Body	Safety Standards	Agency File References
<b>CSA/UL</b>	CAN/CSA 60950-1-07-2nd Ed. ANSI/UL 60950-1-2nd Ed.	CSA Certificate: 2022889
<b>IEC IECCE CB Certification</b>	IEC 60950-1:2005 (2nd Edition); Am 1:2009 EN 60950-1:2006;A11;A01	CB test certificate: No 62105 Nemko: P11213778
<b>CE</b>	Low Voltage Directive (LDV) 2006/95/EC	

## OUTLINE DRAWING AND CONNECTIONS – DE-RATING CURVE

Overall dimensions:

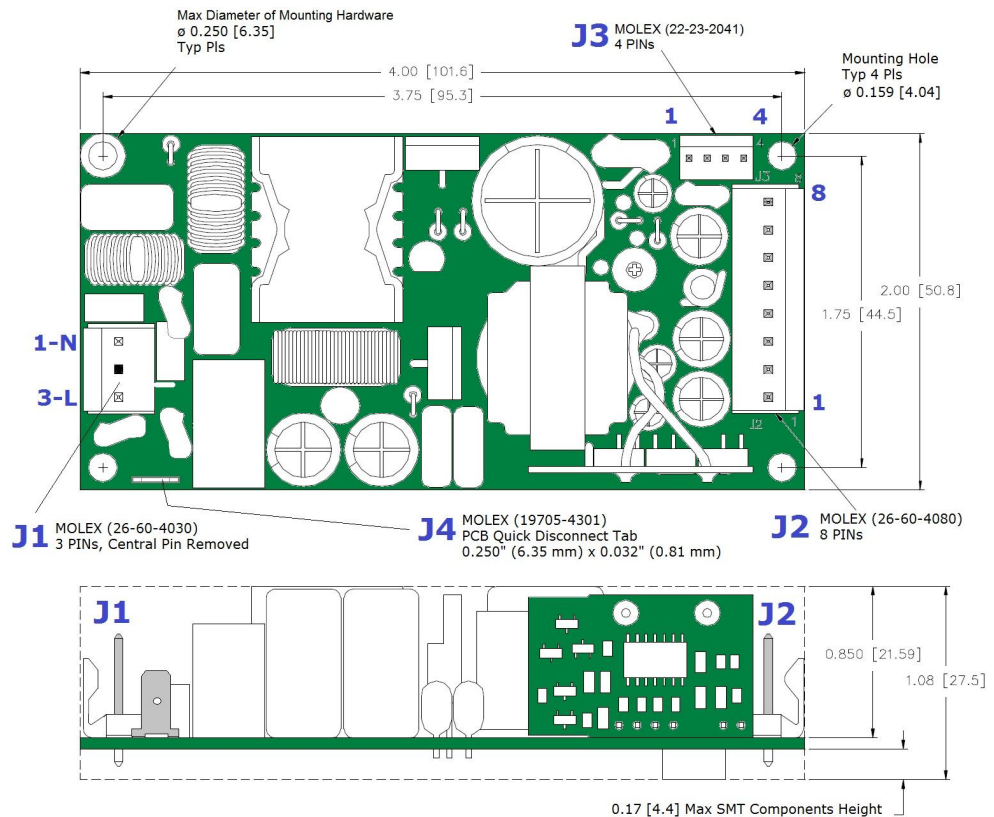
(50.8 X 101.6 X 27.5) mm

(2.00 X 4.00 X 1.08) in

Weight:

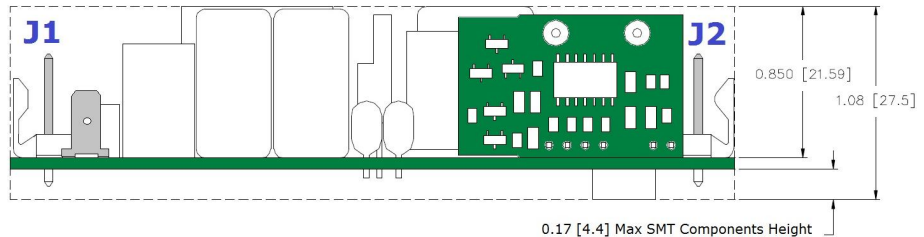
160 g

0.35 lb

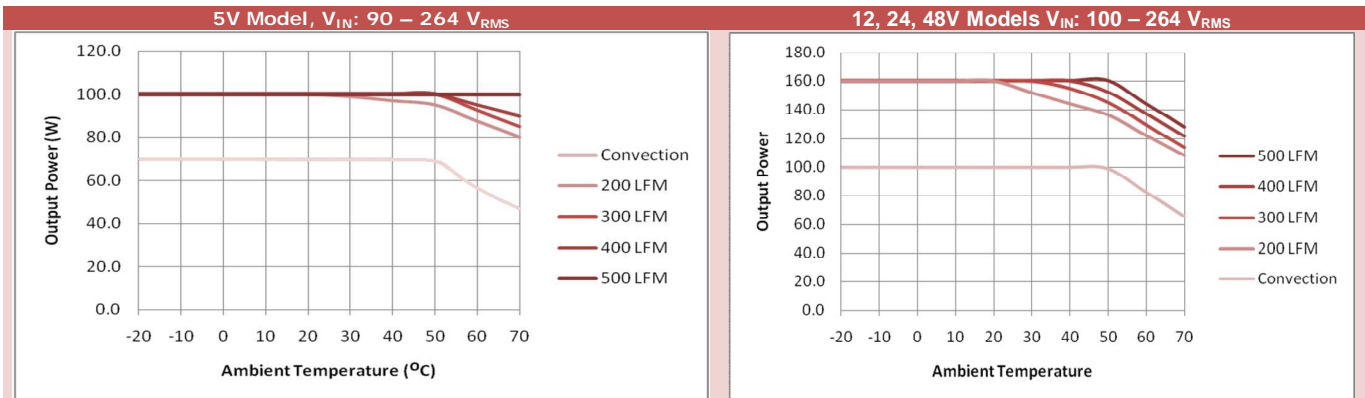


Forced air cooling:

Air flow direction, longitudinal or transverse, must be coplanar to the PCB no matter its orientation.



Connector	Manufacturer and Part Number	Pin Assignment
<b>AC Input Connector J1</b>	Molex 26-60-4030 or equivalent	1: AC Neutral; 2: Not present; 3: AC Live
<b>J1 Mating Connector</b>	Molex 09-93-0300 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)	
<b>Output Connector J2</b>	Molex 26-60-4080 or equivalent	1 – 4: V1 RTN; 5 – 8: +V1
<b>J2 Mating Connector</b>	Molex 09-91-0800 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)	
<b>Auxiliary Connector J3</b>	Molex 22-23-2041 or equivalent	1, 2: -V2; 3, 4: +V2
<b>J3 Mating Connector</b>	Molex 22-01-2047 (Crimp Terminal Housing) Molex 08-50-0113 (Crimp Terminal, 22-24 AWG)	
<b>Protection Earth Tab J4</b>	Molex 19705-4301 (PCB Quick Disconnect Tab (6.35 x 0.81) mm or equivalent)	
<b>J4 Mating Connector</b>	Molex 19003-0001 (Quick Disconnect, Female, for 18-22 AWG, Tab 6.35 x 0.81mm, Tin plated)	



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