

KEY FEATURES

- Universal input voltage range (90 – 264 V_{AC})
- 160 W rated power (100 W natural convection cooling)
- Compact standard form factor (2x4x1) in
- High efficiency (91% typical)
- 12, 24 and 48 V_{DC} standard output voltages
- Active PFC, EN61000-3-2 (Class C, >50% load).
- Low earth leakage current (<200 μA)
- Over temperature protection
- Over voltage protection
- Over Current and short circuit protection
- Auxiliary 12 V_{DC}, 0.5 A output.
- 4000 m altitude operation
- IEC/EN 60950-1 2nd edition compliance
- RoHS 2 compliant (Directive 2011/65/EU)



DESCRIPTION

The SFA160 are high efficiency, small form factor, single output AC-DC, series of power supplies for use in industrial and information technology applications.

The series provide a steady 160 W of regulated DC power from an open-frame 2 x 4 x 1" standard form factor which makes easier its integration into space constrained systems.

By converting energy at 91% typical efficiency, the series generate a low amount of heat facilitating thermal management.

The series come in 12, 24 and 48 V_{DC} standard output voltages and offers an auxiliary 12 V_{DC}, 0.5 A output. It can deliver full output power from -20 to 50 °C at 500 LFM airflow and can be operated up to 70 °C derating output power. When natural convection cooled, the 12, 24, 48 V_{DC} variants can deliver a steady 100 W up to 50 °C ambient.

The SFA160 series can be operated up to 4000 m without de-rating thanks to PCB Creepage and clearances greater than 8 mm.

Protection features include, fuses on both AC lines, output over-current, output short-circuit, output over-voltage and over-temperature.

The SFA160 series comply with the 2nd edition of the IEC/EN 60950-1 safety standards for industrial and information technology equipment. It meets the EN 55022 EMC limits of Class B for conducted emissions as well as the IEC/EN 61000-3 for harmonic content and EN 55024 for EMC immunity.

MARKET SEGMENTS AND APPLICATIONS

- Networking and Communication Equipment
- DSL, Wi-Fi and Wi-Max Base-stations
- LED Industrial Displays, Monitors
- Automation, Drives, Industrial Controls

MODEL CODING AND OUTPUT RATINGS

Model Number	V1 [V]	I1 ¹ Convection [A]	I1 ¹ Forced air [A]	V1 ² Ripple [mV]	V2 [V]	I2 ¹ Rated [A]	V2 ² Ripple [mV]
SFA160-US12	12	8.3	13.3	120	12	0.5	240
SFA160-US24	24	4.1	6.6	240	12	0.5	240
SFA160-US48	48	2.1	3.3	480	12	0.5	240

¹ The combined output power of V1 and V2 must not exceed 100 W at natural convection cooling and 160 W when forced air cooled at 500 LFM, up to 50 °C ambient. In both convection or forced air cooling de-rating applies above 50 °C ambient (see output power – ambient temperature graphs below).

² 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 _{AC} at all load conditions	90	100/240	264	V _{AC}
Input Frequency		47	50/60	63	Hz
DC Input Voltage		170	-	300	V _{DC}
Input Current	RMS at 90 V _{AC} , maximum load	-	-	2.3	A
Inrush Current	No damage at 230 V _{AC} , cold start/hot start.				
Fusing	2.5 A, Time Lag, 250 V on L and N	-	2.5	-	A
Efficiency	115 V _{AC} , full load	-	90	-	%
	230 V _{AC} , full load	-	91	-	%
No load Power Consumption	115 V _{AC}	-	2.5	-	W
	230 V _{AC}	-	2.3	-	W
Power Factor	At full rated load, 115 V _{AC} , 60 Hz	0.98	-	-	
	230 V _{AC} , 50 Hz	0.89	-	-	
Harmonic Current	Complies with EN-61000-3-2. Class D at 230 V _{AC} 50 Hz, Class C at > 50% rated load.				
Fluctuations and Flicker	Complies with EN-61000-3-3 at nominal voltages and full load.				
Earth Leakage Current	264 V _{AC} , 60 Hz, normal condition	-	-	200	μA


OUTPUT SPECIFICATIONS

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


PROTECTION FEATURES

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
Input Under Voltage Lockout	No damage, auto recovery	60	75	-	V _{AC}
Input Fuse	Time Lag 2.5 A, 250 V on L and N				
Over Current	Hiccup mode, auto-recovery	110	-	150	%I _{MAX}
Short Circuit	Hiccup mode, auto-recovery				
Over Voltage	Shut down, latch off mode	110	-	130	%V _{NOM}
Over Temperature	Shut-down, auto-recovery				
Isolation	I-to-O, Reinforced	4000	-	-	V _{AC}
	V1-to-V2	100	-	-	V _{AC}
	I-to-PE	1500	-	-	V _{AC}
	O-to-PE, functional	500	-	-	V _{DC}
Creepage and Clearance		8	-	-	mm


ENVIRONMENTAL SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nominal	Max	Units
Operating Temperature (*)	No de-rating up to 50°C, 50% load at 70°C Linearly de-rate above 50 °C	-20	-	70	°C
Storage Temperature Range		-40	-	80	°C
Cooling	See de-rating curves below	200	-	500	LFM
Relative Humidity	Non-condensing	-	-	95	%
Operating Altitude		-	-	4000	m
Shock	Operating: 10 g, 11 ms, half sine, one shock input in each axes				
Vibration	Operating, sinusoidal: 0.5 g peak-to-peak, 10-300 Hz, 3 axes				
MTBF	>200000 hours at 75% Full Load, Nominal V _{AC} , 25 °C ambient MIL-HDBK-217-E-1				


ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

Phenomenon	Conditions / Notes	Standard	Equipment/Performance Class
Conducted	115 V _{RMS} , 230 V _{RMS} . Maximum load.	EN 55022 EN 60601-1-2	B
Radiated	At 10 m distance	EN 55022	A
Line Voltage Fluctuation and Flicker	At 20%, 50% and 100% maximum load. Nominal input voltages.	EN 61000-3-3	
Harmonic Current Emission	Nominal input voltages. All load conditions.	EN 61000-3-2	D


ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

Phenomenon	Conditions / Notes	Standard	Test Level	Performance criteria
	Reference standard for the medical version	EN 55024		
ESD	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
Radiated Field	3 V/m, 80-1000 MHz, 80% AM, 3 m distance	EN 61000-4-3	3	A
Electric Fast Transient	±2 kV on AC power port ±1 kV on signal/control lines	EN 61000-4-4	3	A
Surge	±1 kV line-to-line ±2 kV line to earth ±0.5 kV for outdoor cables	EN 61000-4-5	3	A
Conducted RF Immunity	3 V _{RMS} , 0,15-80 MHz, 80% AM	EN 61000-4-6	3	A
Magnetic Field Immunity	50 and 60 Hz, 3 A/m			
Dips and Interruptions	Dip to 40% for 5 cycles (100 ms)	EN61000-4-11		B
	Dip to 70% for 25 cycles (500 ms)	EN61000-4-11		B
	Drop-out to 5% for 10 ms	EN61000-4-11		B
	Interrupts > 95% for 5 s	EN61000-4-11		B


SAFETY AGENCIES APPROVALS

Certification Body	Safety standards and file numbers	Agency files references
UL / CSA	UL 60950-1 & CAN/CSA C22.2 No. 60950-1-07	20160823-E134098
CB Certification	IEC 60950-1 (ed.2); am1; am2	NO93398
Nemko	EN 60950-1: 2006; A11; A1; A12; A2	No. P16221302
CE	Low Voltage Directive (LVD) 2014/35/EU Electromagnetic Compatibility (EMC) 2014/30/EU RoHS2 Directive 2011/65/EU	

OUTLINE DRAWING, CONNECTIONS AND OUTPUT POWER DE-RATING

Overall dimensions:

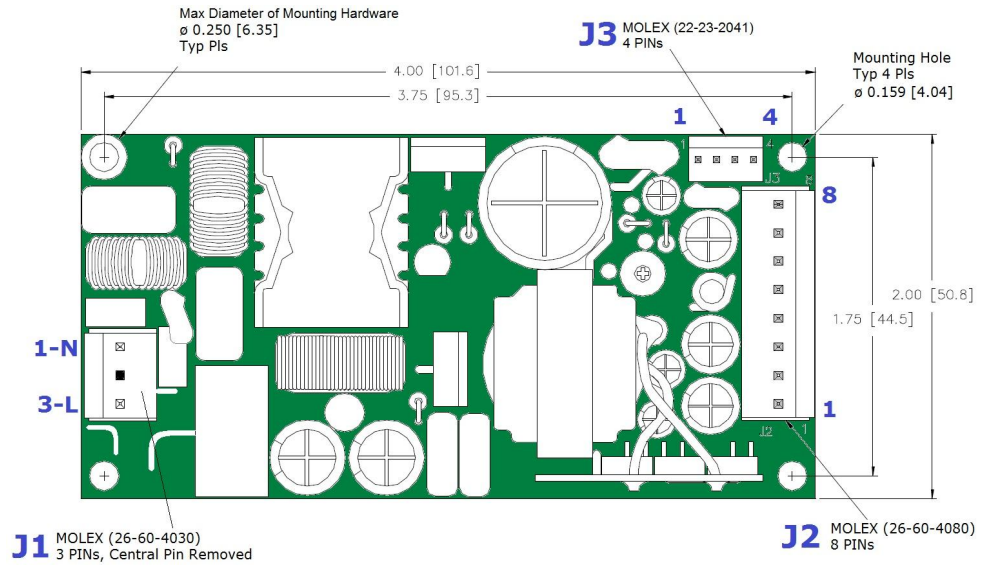
(50.8 X 101.6 X 27.5) mm

(2.00 X 4.00 X 1.08) in

Weight:

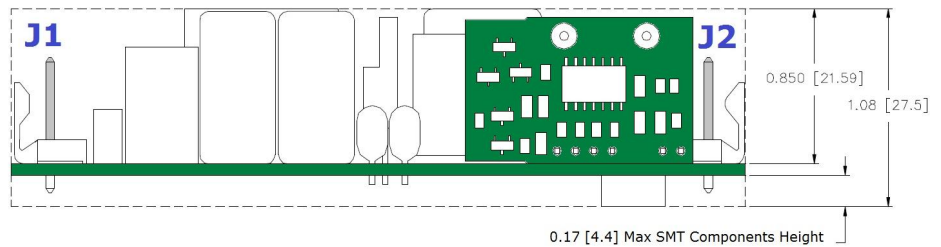
160 g

0.35 lb



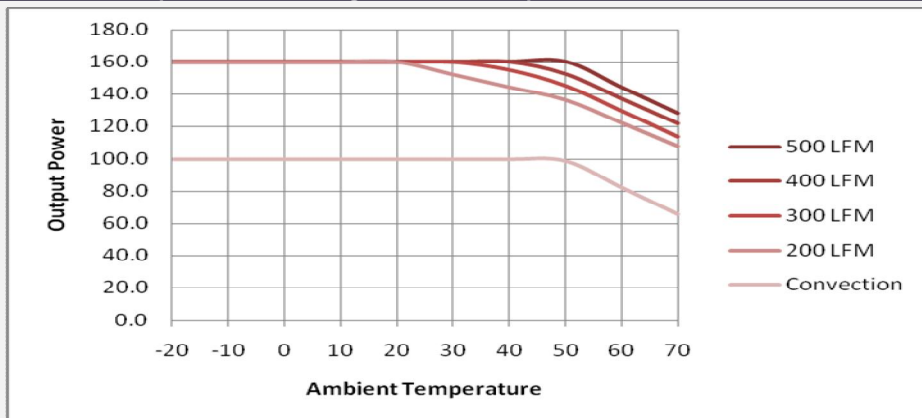
Forced air cooling:

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



Connector	Manufacturer and Part Number	Pin Assignment
AC Input Connector J1	Molex 26-60-4030 or equivalent	1: AC Line 1; 2: Not present; 3: AC Line 2
J1 Mating Connector	Molex 09-93-0300 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)	
Output Connector J2	Molex 26-60-4080 or equivalent	1 – 4: V1 RTN; 5 – 8: +V1
J2 Mating Connector	Molex 09-91-0800 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)	
Auxiliary Connector J3	Molex 22-23-2041 or equivalent	1, 2: V2 RTN; 3, 4: +V2
J3 Mating Connector	Molex 22-01-2047 (Crimp Terminal Housing) Molex 08-50-0113 (Crimp Terminal, 22-24 AWG)	

Output Power De-rating vs Ambient temperature. $V_{IN}: 100 - 264 V_{RMS}$



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