

### DESCRIPTION

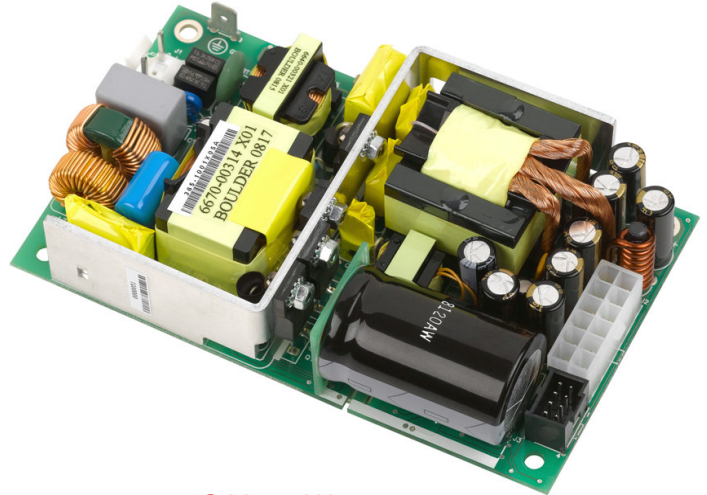
SFA350 is a series of extremely high efficiency, small form factor and single output AC-DC power supplies.

Offering 365 W of regulated DC power from an open frame, industry standard 3" x 5" x 1.28" form factor, the SFA350 series occupies 50% less space in a system. The extremely high power density enable designers to integrate more advanced features into a system without compromising on its size.

By converting energy at >90% efficiency, the SFA350 generates less heat facilitating higher reliability and again space saving designs.

The SFA350 series comply with IEC/EN 60950-1 safety and with EN61000-3, EN61000-4 EMC standards.

The series is available in three different high power output voltages at 12V, 24V or 48V and is equipped with an auxiliary low power 12V and 5V stand-by outputs.



**2 YEAR WARRANTY**

### KEY FEATURES

- 365 W active PFC power supply
- Very small form factor (3 x 5 x 1.28) in
- Extremely high efficiency (>90%)
- 12V, 24V and 48V standard output variants
- Universal input voltage range
- Active PFC, EN61000-3-2 compliant
- Low heart leakage current
- Over temperature protection
- OV, OC, and short circuit protections
- Stand-by +5 V Output
- Auxiliary fan +12 V output
- Remote enable signal
- DC power good signal
- RoHS-6 compliant (EU directive 2002/95/EC)

### TARGET APPLICATIONS

- Video Wall Display
- Communications
- Laboratory Equipment
- Test and Measurement

### MODELS AND OUTPUT SPECIFICATIONS

Model	V1	I1 <sup>1</sup> Convection	I1 <sup>2</sup> Forced air	V1 <sup>3</sup> Ripple	V2	I2 <sup>1</sup> Convection	I2 <sup>2</sup> Forced air	V2 <sup>3</sup> Ripple	5V <sub>SB</sub>	I5V <sub>SB</sub> <sup>1</sup> Convection	I5V <sub>SB</sub> <sup>2</sup> Forced air	5V <sub>SB</sub> <sup>3</sup> Ripple
<b>SFA350-US12</b>	12 V	16.6 A	30.4 A	120 mV	12 V	0.5 A	1 A	240 mV	5 V	1 A	2 A	50 mV
<b>SFA350-US24</b>	24 V	8.3 A	15.2 A	240 mV	12 V	0.5 A	1 A	240 mV	5 V	1 A	2 A	50 mV
<b>SFA350-US48</b>	48 V	4.16 A	7.6 A	480 mV	12 V	0.5 A	1 A	240 mV	5 V	1 A	2 A	50 mV

<sup>1</sup> The combined output power of V1, V2 and 5V<sub>SB</sub> must not exceed 200 W for all models when convection cooled.

<sup>2</sup> The combined output power of V1, V2 and 5V<sub>SB</sub> must not exceed 365 W for all models at 400 LFM, (the maximum heat sink temperature must remain below +110 °C at +50 °C ambient temperature).

<sup>3</sup> Peak-to-Peak measured at 20 MHz Bandwidth.

## INPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
<b>AC Input Voltage</b>	PS starts and operates at 90 V <sub>AC</sub> at all load conditions	90	100/240	264	V <sub>AC</sub>
<b>DC Input Voltage</b>		170	-	370	V <sub>DC</sub>
<b>Input Frequency</b>		47	-	63	Hz
<b>Input Current</b>	RMS at 180 V <sub>AC</sub> , maximum load	-	-	2.5	A
	RMS at 90 V <sub>AC</sub> , maximum load	-	-	5	A
<b>Inrush Current</b>	230 V <sub>AC</sub> , cold start, no damage	-	-	-	A
<b>Fusing</b>	2X Time Lag 6.3 A, 250 V on L and N	-	-	6.3	A
<b>Efficiency</b>	50% max rated load	90	-	-	%
	20/100% max rated load	88	-	-	%
	Nominal V <sub>IN</sub> , all versions.	-	-	-	-
<b>+5V<sub>SB</sub> Consumption</b>	No load, nominal V <sub>IN</sub>	-	-	1	W
<b>Power Factor</b>	At full rated load, 115 V <sub>AC</sub> 60 Hz and 230 V <sub>AC</sub> 50 Hz input voltages	0.9	-	-	-
	Complies with EN-61000-3-2	-	-	-	-
<b>Harmonic Current</b>	At full rated load, 115 V <sub>AC</sub> 60 Hz and 230 V <sub>AC</sub> 50 Hz input voltages	-	-	-	-
<b>Leakage Current</b>	120 V <sub>AC</sub> , 60 Hz, normal condition	-	-	110	μA
	230 V <sub>AC</sub> , 60 Hz, normal condition	-	-	275	μA

## OUTPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Min.	Nom.	Max.	Units
<b>V1 Output Voltage</b>	12V	11.4	12	12.6	V
	24V	22.8	24	25.2	V
	48V (1% set point accuracy)	45.6	48	50.4	V
<b>V1 Output Power Rating</b>	All models, convection cooling	-	-	200	W
	All models, forced air cooling (400 LFM)	-	-	365	W
<b>V2 Output Voltage</b>	All models (15% set point accuracy)	10.2	12	13.8	V
<b>V2 Output Current</b>	All models, convection cooling	-	-	0.5	A
	All models, forced air cooling (400 LFM)	-	-	1	A
<b>5V<sub>SB</sub> Output Voltage</b>	All models (5% set point accuracy)	4.75	5	5.25	V
<b>5V<sub>SB</sub> Output Current</b>	All models, convection cooling	-	-	1	A
	All models, forced air cooling (400 LFM)	-	-	2	A
<b>V1 Voltage Adjustment Range</b>		±5	-	-	%V1
<b>V1 Load-Line-Cross Regulation</b>	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub> V1 Load: 0 – 30.4 A (12V) 0 – 15.2 A (24V) 0 – 7.6 A (48V) V2 Load: 0 – 1 A 5V <sub>SB</sub> Load: 0 – 2 A	-	-	±3.0	%V1
<b>V2 Load-Line-Cross Regulation</b>	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub> V1 Load: 0 – 30.4 A (12V) 0 – 15.2 A (24V) 0 – 7.6 A (48V) V2 Load: 0 – 1 A 5V <sub>SB</sub> Load: 0 – 2 A	-	-	±15	%V2
<b>5V<sub>SB</sub> Load-Line-Cross regulation</b>	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub> V1 Load: 0 – 30.4 A (12V) 0 – 15.2 A (24V) 0 – 7.6 A (48V) V2 Load: 0 – 1 A 5V <sub>SB</sub> Load: 0 – 2 A	-	-	±5.1	%5V <sub>SB</sub>
<b>V1 Line Regulation</b>	V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>	-	-	±0.1	%V1

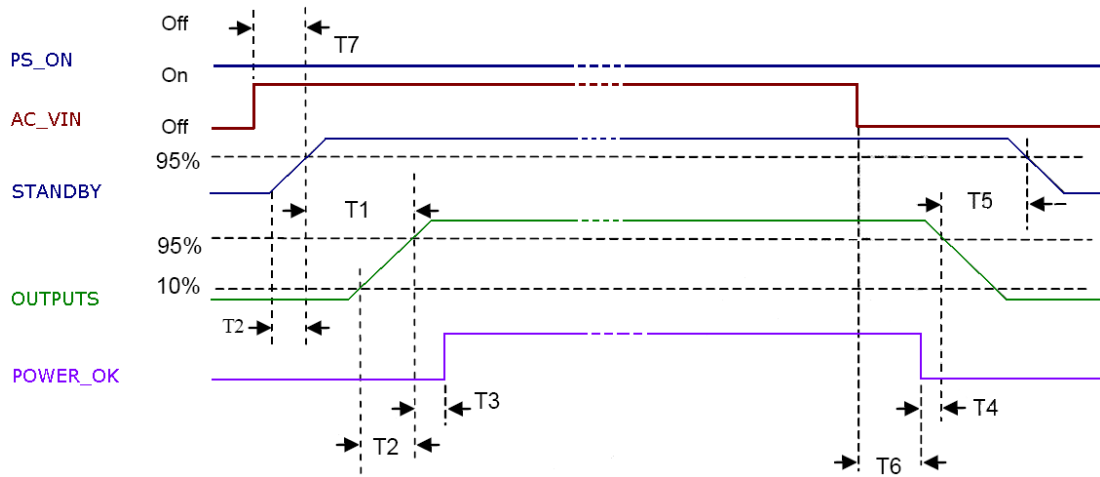
## OUTPUT SPECIFICATIONS (CONTINUE)

<b>Transient Response (Voltage Deviation) V1, 5V<sub>SB</sub></b>	25% load changes at 1 A/ $\mu$ s				
	12V at 2200 $\mu$ F Load / I <sub>OUT</sub> > 0.5 A				%V1
	24 V at 1000 $\mu$ F Load / I <sub>OUT</sub> > 0.5 A	-	-	$\pm$ 5	%5V <sub>SB</sub>
	48V at 560 $\mu$ F Load / I <sub>OUT</sub> > 0.5 A				
<b>V1 Ripple &amp; Noise</b>	5V <sub>SB</sub> at 560 $\mu$ F Load / I <sub>OUT</sub> > 0.1 A				
	All models, Peak-to-peak, 20 MHz BW. 470 pF ceramic and 22 $\mu$ F tantalum caps at the load (resistive).	-	-	1	%V1
<b>Rise Time</b>	At 230 V <sub>AC</sub> , 60% max rated load	0,2	-	20	ms
<b>Start-up Delay</b>	V1 in regulation after PS_ON is asserted			350	
	V1 in regulation after AC is applied	-	-	900	ms
	5V <sub>SB</sub> in regulation after AC is applied			700	
<b>Turn-on Overshoot</b>	At 500 mA output current, V1 in regulation within 50 ms.		10		%V1
		-	10	-	%V2
			10		%V <sub>SB</sub>
<b>Hold-up Time</b>	At nominal V <sub>IN</sub> , full load, for all outputs	20	-	-	ms
<b>Minimum Load</b>	All models; V1, V2 and 5V <sub>SB</sub>	0	-	-	A
<b>Temperature Drift</b>		-1.2	-	+1.2	mV/°C

## SIGNALS/CONTROLS

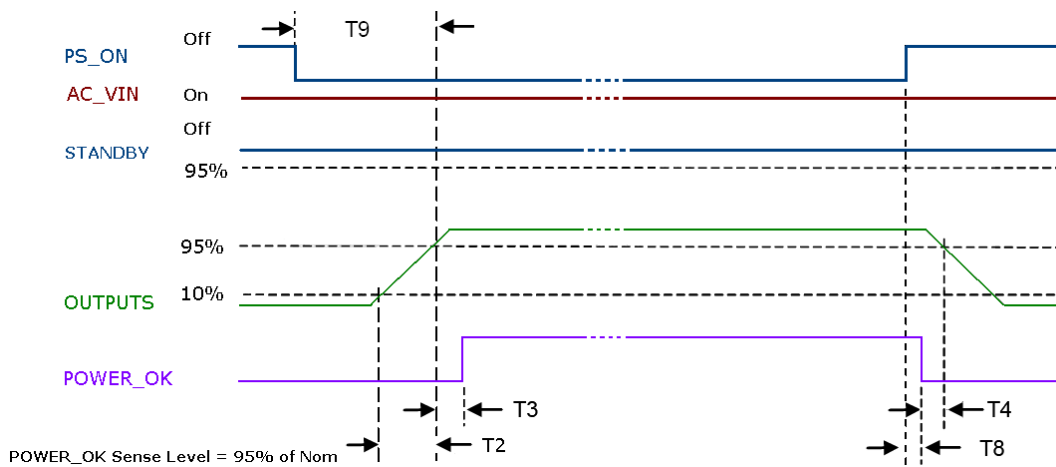
Signal	Notes	Min	Typ	Max	Unit
<b>PS_ON</b>	Active low, +5 V TTL signal compatible. Input low voltage	0	-	2.5	V
	Input high voltage (I <sub>IN</sub> = 200 $\mu$ A)	2.5	-	-	V
	V1 and V2 disabled when PS_ON is open				
	5V <sub>SB</sub> not affected by PS_ON				
<b>P_OK</b>	V1 and V2 enabled with PS_ON connected to RTN				
	+5 V TTL compatible				
	Logic level low (<10 mA sinking)	-	-	0.4	V
	Logic level high (200 $\mu$ A sourcing)	2.4	-	5	V
<b>5V<sub>SB</sub> output</b>	Low to high time after V1 in regulation	0.1	-	0.5	s
	Power down warning time	1	-	-	ms
	Active and in regulation after a 90<V <sub>AC</sub> <264 is applied	-	-	700	ms
	5V <sub>SB</sub> not affected by PS_ON				

**SIGNAL TIMINGS**



Above waveforms are expected with AC Input ON/OFF:

Standby on - Main outputs on	$1 \text{ ms} \leq T1 \leq 200 \text{ ms}$
Main output Rise Time	$0.2 \text{ ms} \leq T2 \leq 20 \text{ ms}$
Main outputs On - P_OK delay	$100 \text{ ms} \leq T3 \leq 500 \text{ ms}$
Power down warning <sup>1</sup>	$T4 \geq 1 \text{ ms}$ (converter off)
Main Output off - Standby off <sup>2</sup>	$T5 \geq 1 \text{ ms}$
Hold-up time (AC off - Main Output off)	$T6 \geq 20 \text{ ms}$ (115/ 230 VAC)
AC_ON - Standby turn on time	$T7 \leq 700 \text{ ms}$



Above waveforms are expected with PS\_ON Signal ON/OFF state change:

Main Output Rise Time	$0.2 \text{ ms} \leq T2 \leq 20 \text{ ms}$
Main Outputs on - P_OK delay	$100 \text{ ms} \leq T3 \leq 500 \text{ ms}$
Power down warning <sup>1</sup>	$T4 \leq 1 \text{ ms}$ (converter off)
PS_ON - Main Output (off) Timing	$T8 \leq 60 \text{ ms}$
PS_ON - Main Output (on) Timing	$T9 \leq 350 \text{ ms}$

<sup>1</sup> T4 parameter measurement setup will assume at least 10% of the maximum load on each output.

<sup>2</sup> T5 parameter measurement setup will assume at least 50% of the maximum load on main output.



## PROTECTION FEATURES

Specification	Test Conditions / Notes	Min.	Nominal	Max.	Units
<b>Input Under Voltage Lockout</b>	Auto Recovery, Hiccup Mode	60	75	-	V <sub>AC</sub>
<b>Input Fuse</b>	2X Time Lag 6.3 A, 250 V on L and N	-	-	6.3	A
<b>Over Current</b>	At nominal input voltages, any load, max. 1 minute. Hiccup mode with auto recovery	-	-	150	%I <sub>1MAX</sub>
<b>Over Voltage</b>	12V 24V 48V 5V <sub>SB</sub>  Maximum voltages under single component failure	13.2 26.4 52 5.5	- - - -	15 30 60 6.8	V
<b>Short Circuit</b>	Hiccup mode with auto recovery				
<b>Over Temperature</b>	Hiccup mode with auto recovery				
<b>Isolation Input-Output</b>		4000	-	-	V <sub>AC</sub>
<b>Isolation Input-Ground</b>		1500	-	-	V <sub>AC</sub>
<b>Isolation V1/V2</b>		100	-	-	V <sub>DC</sub>
<b>Isolation Output/Ground</b>		500	-	-	V <sub>AC</sub>

## ENVIRONMENTAL SPECIFICATIONS

Specification	Test Conditions / Notes	Min	Nominal	Max	Units
<b>Operating Temperature Range</b>	No de-rating up to 50°C	-20	-	50	°C
<b>De-rated Operating Temperature Range</b>	Linearly de-rate from full load at 50 °C to half load at 70 °C	-	-	70	°C
<b>Storage Temperature Range</b>		-40	-	85	°C
<b>Humidity</b>	RH, Non-condensing Operating Non-operating	-	-	90 95	% %
<b>Operating Altitude</b>		-	-	3000	m
<b>Shock</b>	Operating: Half-sine 11ms, 2 shock on each axis Non-operating: Half-sine 2ms, 2 shock on each axis	-	-	10 140	g g
<b>Vibration</b>	Operating: 5-500Hz, 3 axis	-	-	2	g
<b>MTBF</b>	75% Full Load, Nominal V <sub>AC</sub> , 35 °C MIL-HDBK-217-E-1	250000	-	-	Hours
<b>Cooling</b>	Convection Forced air	10 -	- -	- 400	 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	A
<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	A

## ELECTROMAGNETIC COMPATIBILITY (EMC) - IMMUNITY

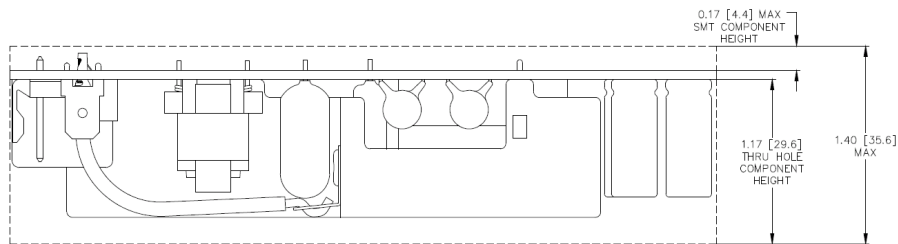
Phenomenon	Conditions / Notes	Standard	Test Level	Performance criteria
<b>ESD</b>	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
<b>Radiated Field</b>	3 V/m, 80-1000 MHz, 1 KHz/2 Hz 80% AM. Dwell time is 3 sec for 2 Hz modulation Dwell time is 1 sec for 1KHz modulation	EN 61000-4-3	3	A
<b>Electric Fast Transient Surge</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 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>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 and file numbers	Category
<b>CSA/UL</b>	CSAC22.2 No. 60950-1	ITE
<b>IEC IECEE</b>	IEC EN 60950-1	ITE
<b>CB Certification</b>	IEC EN 61558-2-16 (12 V <sub>DC</sub> version only)	SMPS
<b>CE</b>	LVD 73/23/EEC	

## MECHANICAL SPECIFICATION

Connector	Manufacturer and Part Number
<b>Input Connector J1</b>	Molex 26-60-4030 or equivalent
<b>J1 Mating Connector</b>	Molex 09-91-0300 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)
<b>Ground Connector GND</b>	Molex 19705-4301 or equivalent
<b>Ground Mating Connector</b>	Molex 0190030001 or equivalent
<b>Output Connector J2</b>	Molex 39-28-1123 or equivalent
<b>J2 Mating Connector</b>	Molex 39-01-2120 (Crimp Terminal Housing) Molex 39-00-0039 (Crimp Terminal, 18-24 AWG)
<b>Output Connector J3</b>	Molex 90130-1108 or equivalent
<b>J3 Mating Connector</b>	Molex 90142-0008 (Crimp Terminal Housing) Molex 90119-0109 (Crimp Terminal, 22-24 AWG)



### Input Connector J1

Pin	Function
1	AC Live
2	AC Neutral

### Input Ground connector GND

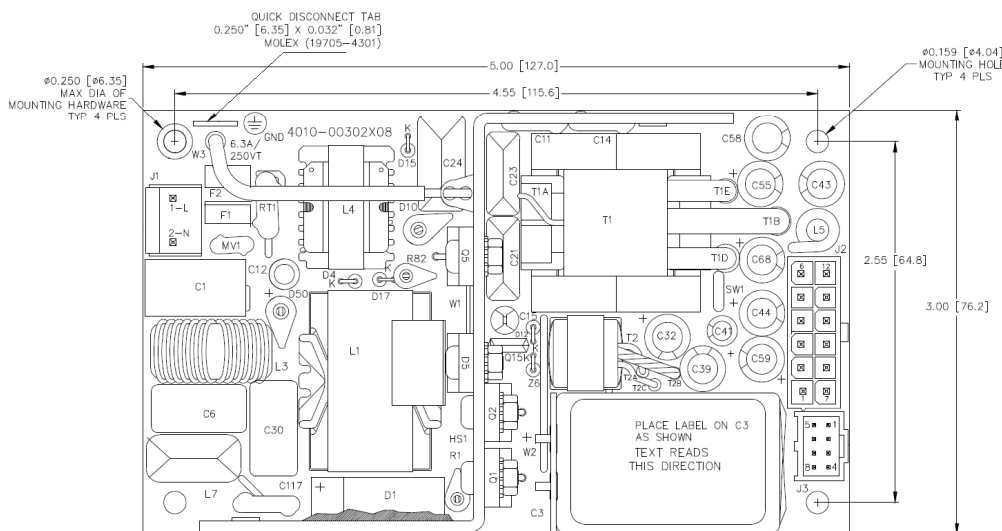
GND	AC Ground
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### Output Connector J2

Pin	Function
1	V1
2	V1
3	V1
4	V1
5	V1
6	V1
7	DC Return
8	DC Return
9	DC Return
10	DC Return
11	DC Return
12	DC Return

### Output Connector J3

Pin	Function
1	+5V <sub>SB</sub>
2	-V2
3	RS+
4	+V2
5	POK
6	PS ON
7	RS-
8	-5V <sub>SB</sub>



  
**Recommended Air Flow Direction**

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