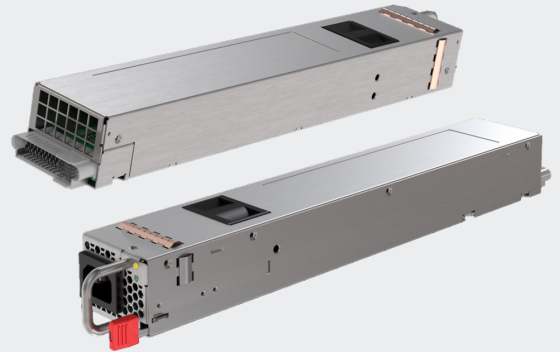


ARTESYN CSS1500FP-3

1500 W Distributed Power System



Advanced Energy's Artesyn CSS1500FP-3 series bulk front end AC-DC power supply accepts a wide range 90 to 264 VAC input and provides a main 12 V output plus a 3.3 V standby output. Rated at 1500 W it is an 80 Plus Platinum supply with a high peak efficiency of 94%. Housed in an industry standard 1U x 2.1 inch rack-mounting package, the power supply is ideal for space-constrained applications. This series comes in two airflow versions – DC-connector to AC-connector and vice versa.

SPECIAL FEATURES

- 1500 W output power
- High power and short form factor
- 1U power supply
- Power density: 35.1 W/in³
- Active Power Factor Correction
- EN61000-3-2 harmonic compliance
- Inrush current control
- 80plus platinum efficiency
- N+1 or N+N redundant
- Hot-pluggable
- Active current sharing
- Full digital control
- PMBus compliant
- Accurate input power reporting
- Compatible with Artesyn's Universal PMBus GUI
- Reverse airflow option
- Two-year warranty

COMPLIANCE

- EMI conducted/radiated Class A Limits + 6 dB margin
- EN61000-4 electromagnetic compatibility
- RoHS 6/6

SAFETY

- UL/cUL 62368 (UL Recognized)
- DEMKO+ CB Report EN62368
- CE Mark
- China CCC
- BSMI
- UKCA

AT A GLANCE

Front-end Bulk Power

Total Output Power

1500 W continuous

Wide Input Voltage

90 to 264 VAC
180 to 350 VDC



ELECTRICAL SPECIFICATIONS

Input						
Input range	90 to 180 VAC low line 180 to 264 VAC high line 180 to 350 VDC high voltage DC input					
Frequency	47 Hz to 63 Hz					
Efficiency	80 plus @ platinum 20% load with 90%; 50% load with 94%; 100% load with 91% at 230 VAC					
Max input current	17 Arms					
Inrush current	90 Apk					
Conducted EMI	Class A +6 dB margin					
Radiated EMI	Class A +6 dB margin					
Power factor	> 0.9 beginning at 20% load					
ITHD	10%					
Leakage current	1.75 mA					
Hold-up time	12 ms @ 1500W; 20 ms @ 90W;					
Output						
	Main DC Output			Standby DC Output		
	MIN	NOM	MAX	MIN	NOM	MAX
Nominal setting	-1%	12	+1%	-1%	3.3	1%
Total output regulation range	11.64 V	12	12.36 V	3.14 V	3.3	3.46 V
Dynamic load regulation range	11.64 V		12.36 V	3.14 V		3.46 V
Output ripple			180 mVp-p			45 mVp-p
Output current - Low line	0.5 A ¹		92 A	0.1 A		5.0 A
Output current - High line & HVDC	0.5 A ¹		125 A	0.1 A		5.0 A
Current sharing	Within ±5.625A of each other from 25% to 100% load			N/A		
Capacitive loading	500 µF		11,000 µF	20 µF		1000 µF

Protections			
Main Output	MIN	NOM	MAX
Overcurrent protection ²	107%		130%
Overvoltage protection ¹	13.2 V		15.0 V
Overtemperature protection		Yes, autorecovery	
Fan fault protection		Yes	
Standby Output			
Overcurrent protection ³ :	110%		150%
Overvoltage protection ¹	3.6 V		3.9 V

¹ Latch mode² No shutdown if the overcurrent is within the range and does not last for more than 200 ms, otherwise latch will occur³ Autorecovery

CONTROL AND STATUS SIGNALS

Input Signals			
PSON_L			
Active LOW signal which enables/disables the main output. Pulling this signal LOW will turn-on the main output. Recommended pull-up resistor to VSB is 5.1 kohms. A 100 pF decoupling capacitor is also recommended.			
		MIN	MAX
V _{IL}	Input logic level LOW		0.8 V
V _{IH}	Input logic level HIGH	2.0 V	3.6 V
I _{SOURCE}	Current that may be sourced by this pin		2 mA
I _{SINK}	Current that may be sunk by this pin at low state		0.5 mA
PSKILL_H			
First break/last mate active LOW signal which enables/disables the main output. This signal will have to be pulled to ground at the system side with a 220 ohm resistor. A 100 pF decoupling capacitor is also recommended.			
		MIN	MAX
V _{IL}	Input logic level LOW		0.8 V
V _{IH}	Input logic level HIGH	2.0 V	3.6 V
I _{SOURCE}	Current that may be sourced by this pin		2 mA
I _{SINK}	Current that may be sunk by this pin at low state		0.5 mA
VSENSE+, VSENSE-			
VSENSE+ and VSENSE- lines are the remote sense lines for regulation. Each line will compensate for a maximum of 100 mV			

ORDERING INFORMATION

Model Number	Nominal Main Output	Standby Output	Airflow Direction
CSS1500FP-3-100	12 V	3.3 V	Forward air flow (FAF/PI) (from output to input connector)
CSS1500FP-3-101	12 V	3.3 V	Reverse ¹ air flow (RAF/PE) (from input to output connector)

¹ Derating may apply

I2C ADDRESSING

A1 Pin	A0 Pin	PMBus (w/r)
0	0	B0/B1
0	1	B2/B3
1	0	B4/B5
1	1	B6/B7

CONTROL AND STATUS SIGNALS (CONTINUED)

Output Signals			
ACOK			
Signal used to indicate the presence of AC input to the power supply. A logic level HIGH will indicate that the AC input to the power supply is within the operating range while a logic level LOW will indicate that AC has been lost.			
This is an open collector/drain output. This pin is pulled high by a 10 kohm resistor connected to 3.3 V inside the power supply. It is recommended that this pin be connected to a 100 pF decoupling capacitor and pulled down by a 100 kohm resistor.			
		MIN	MAX
V _{IL}	Input logic level LOW		0.6 V
V _{IH}	Input logic level HIGH	2.0 V	3.6 V
I _{SOURCE}	Current that may be sourced by this pin		3.3 mA
I _{SINK}	Current that may be sunk by this pin at low state		0.7 mA
PWR_GOOD / PWOK			
Signal used to indicate that main output voltage is within regulation range. The PWR_GOOD signal will be driven HIGH when the output voltage is valid and will be driven LOW when the output falls below the under-voltage threshold.			
This signal also gives an advance warning when there is an impending power loss due to loss of AC input or system shutdown request. More details in the Timing Section.			
This is an open collector/drain output. This pin is pulled high by a 10 kohm resistor connected to 3.3 V inside the power supply. It is recommended that this pin be connected to a 100 pF decoupling capacitor and pulled down by a 100 kohm resistor.			
		MIN	MAX
V _{IL}	Input logic level LOW		0.8 V
V _{IH}	Input logic level HIGH	2.0 V	3.6 V
I _{SOURCE}	Current that may be sourced by this pin		3.3 mA
I _{SINK}	Current that may be sunk by this pin at low state		0.7 mA

Output Signals			
PS_PRESENT			
Signal used to indicate to the system that a power supply is inserted in the power bay. This pin is shorted to the standby return in the power supply. Recommended pull-up resistor to VSB is 5.1 kohms. A 100 pF decoupling capacitor is also recommended.			
PS_INTERRUPT			
Active low signal used by the power supply to indicate to the system that a change in power supply status has occurred. This event can be triggered by faults such as OVP, OCP, OTP, and fan fault. This signal can be cleared by a CLEAR_FAULT command. Recommended pull-up resistor to VSB is 5.1 kohms. A 100 pF decoupling capacitor is also recommended.			
		MIN	MAX
V _{IL}	Input logic level LOW		0.8 V
V _{IH}	Input logic level HIGH	2.0 V	3.6 V
I _{SOURCE}	Current that may be sourced by this pin		4 mA
I _{SINK}	Current that may be sunk by this pin at low state		4 mA

BUS Signals			
ISHARE			
Bus signal used by the power supply for active current sharing. maximum 6 units in parallel			
Voltage Range	The range of this signal for active sharing will be up to 8.0 V, which corresponds to the maximum output current.		
		MIN	MAX
I _{SHARE} Voltage	Input logic level LOW	7.75	8.25
	Voltage at 50% load, stand-alone unit	3.85	4.15
	Voltage at 0% load, stand-alone unit	0	1.0
I _{SOURCE}	Current that may be sourced by this pin		160 mA
SCL, SDA			
Clock and data signals defined as per I2C requirements. It is recommended that these pins be pulled-up to a 2.2 kohm resistor to 3.3 V and a 100 pF decoupling capacitor at the system side.			
VL	Input logic level LOW		0.8 V
VH	Input logic level HIGH	2.0 V	3.6 V

Note: All signal noise levels are below 400 mVpk-pk from 0 - 100 MHz.

ELECTRICAL SPECIFICATIONS

LED Indicators

A single bi-color LED is used to indicate the power supply status.

	Status LED	Fail LED
Color	Green	Amber/Green
No input to PSU	Off	Off
Input present, STBY ON, main output OFF	On	Blinking Amber, at least 1 Hz
Main output ON	On	green
Power supply warning (hi-temp)	On	Blinking Amber/Green, at 1:1 ratio, at least 1 Hz
Power supply warning (slow fan)	On	Blinking Amber/Green, at 1:1 ratio, at least 1Hz
Power supply failure (OVP, OTP, FAN FAULT)	On	Amber

Firmware Reporting And Monitoring

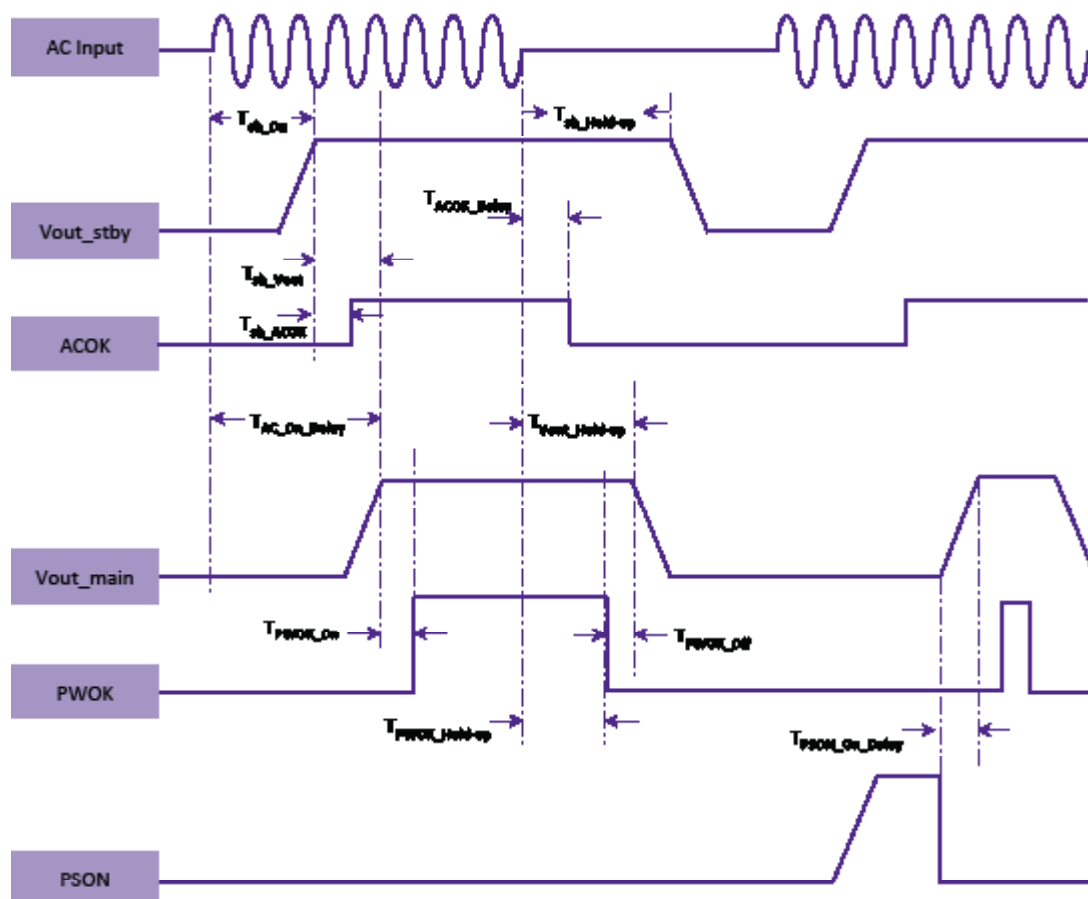
	Accuracy Range		
Output loading	<10%	10% to 20%	20% to 100%
Input voltage	±5%		
Input current	±1 A fixed error	±10%	±5%
Input power	30 W fixed error up to 120 W	±15%	±10%
Output voltage	±5%		±2%
Output current	0.8 A fixed error	±15%	±5%
Temperature	±5 °C		
Fan speed	Actual ±250 RPM		

PMBus	YES
Remote ON/OFF	YES

Timing Specifications

	Description	Min	Max	Unit
T _{sb_On}	Delay from AC being applied to standby output being within regulation		2500	ms
T _{sb_ACOK}	Delay from standby output to ACOK assertion		1500	ms
T _{sb_Vout}	Delay from standby output to main output voltage being within regulation		1000	ms
T _{AC_On_Delay}	Delay from AC being applied to main output being within regulation		3000	ms
T _{PWR_GOOD_On}	Delay from output voltages within regulation limits to PWOK asserted	100	1000	ms
T _{ACOK_Delay}	Delay from loss of AC to assertion of ACOK		20	ms
T _{PWR_GOOD_Hold-up}	Delay from loss of AC to deassertion of PWOK	5		ms
T _{Vout_Hold-up}	Delay from loss of AC to main output being within regulation	16		ms
T _{sb_Hold-up}	Delay from loss of AC to standby output being within regulation	25		ms
T _{PWR_GOOD_Off}	Delay from deassertion of PWOK to output falling out of regulation	1	700	ms
T _{PSON_On_Delay}	Delay from PSOK assertion to output being within regulation		400	ms

TIMING DIAGRAM

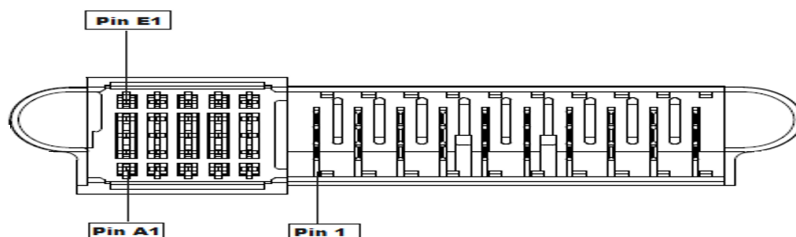


MECHANICAL OUTLINE

Internal Fan	40 * 40 * 28 mm
Power Supply	54.5 (Width) * 40.6 (Height) * 321.5 (Length) mm

OUTPUT CONNECTOR

Output Connector Part Number	TEI 2-1926736-2
Mating Connector Part Number	TEI 2-1926739-5, 1892787-6 or equivalent



Output Connector Pin Configuration		
A1	3.3 VSB	Standby Output
B1	3.3 VSB	Standby Output
C1	3.3 VSB	Standby Output
D1	3.3 VSB	Standby Output
E1	3.3 VSB	Standby Output
A2	SGND	Signal Ground
B2	SGND	Signal Ground
C2	Reserved	
D2	Reserved	
E2	Reserved	
A3	A2/A_Select	Optional address line
B3	A0	I ² C Address
C3	SDA	I ² C Data
D3	-Remote_Sense	Wire drop compensation
E3	+Remote_Sense	Wire drop compensation
A4	SCL	I ² C Clock
B4	PSON_L	Enable/Inhibit
C4	PS_INTERRUPT_L	Alert for failure
D4	A1	I ² C Address
E4	ACOK	Input indicator
A5	PSKILL_L	First break/lastmate pin
B5	ISHARE	Current share bus
C5	PWOK	Output indicator
D5	Reserved	
E5	PS_PRESENT_L	Power supply present
P1-P5	+12 V Return	Main output return contact
P6-P10	12 V	Main output power contact

ENVIRONMENTAL SPECIFICATIONS

Operating temperature	CSS1500FP-3-100 CSS1500FP-3-101	Full power at 0 to 55 °C (FAF, 100% load, 1100 W LL/1500 W HL, 0" H ₂ O) Full power at 0 to 45 °C (RAF, 100% load, 1100 W LL/1500 W HL, 0" H ₂ O)
Operating relative humidity	5% to 90% non-condensing	
Operating altitude	up to 10,000 feet	
Non-operating temperature	-40 to +70 °C	
Non-operating relative humidity	10% to 95% non-condensing	
Non-operating altitude	up to 50,000 feet	
Storage temperature	-40 to +85 °C	
Storage relative humidity	5% to 95% non-condensing	
Vibration and shock	Standard operating/non-operating random shock and vibration	
RoHS compliance	Yes	
MTBF	>500,000 hours using Telcordia Issue 2, Method 1 Case 1 at 40 °C ambient at full load.	
Operating life	Minimum of 7 years at typical operating conditions	
Reliability	All electronic component derating analysis and capacitor life calculation is done at 40 °C ambient, 80% of maximum rated load, nominal input line voltage.	



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ABOUT ADVANCED ENERGY

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Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

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