

# APC-F501 Series DC-DC CONVERTER

500W Single Output Full Brick 24V input, 48V output

Advanced  
APower  
AC Conversion PLC

## Provisional Product Specification

This rare **STEP-UP** converter gives the DPA designer added versatility and space saving capability in a cost effective package.

The APC500 represents a major achievement in the development of high power, high-density DC converter modules, providing 500Watts of power in the industry standard "full brick" size case.

This gives exceptional power density (90w/in<sup>3</sup> / 5.53cm<sup>3</sup>) allowing over twice the power output from the same space as the standard range of full brick size converters on the market.

At greater than 88% efficiencies, with fixed frequency operation and low ripple the APC-F501 is ideally suited for the telecoms and IT industries, while automated production and test ensure high reliability.

The comprehensive list of in-built protection functions such as over voltage protection, under-voltage protection and short circuit protection are complemented by unique features such as the thermal monitoring voltage to provide early warning of system fault.

### FEATURES

- ❑ Exceptional efficiency of >88%
- ❑ Outstanding power density – 5.53cm<sup>3</sup>
- ❑ Standard "full brick" package (116.8 x 61 x 12.7mm)
- ❑ Low input & output ripple currents
- ❑ Input transient voltage protection
- ❑ Thermal monitoring voltage to provide early warning of system fault
- ❑ Single connection for parallel operation to provide true N+1 redundancy capability
- ❑ No need for master/slave operation
- ❑ External synchronisation facility
- ❑ Hot plug in capability
- ❑ Remote sensing provided
- ❑ Remote shutdown
- ❑ Wide input voltage range
- ❑ Output current monitor voltage
- ❑ Thermal protection & Current limit protection
- ❑ **STEP-UP** from 12V or 24V input.

**2 Year Warranty**



## APC-F501 Full Brick Single Output DC-DC Converter - 24Vi, 48Vo 500W

### Absolute Maximum Ratings

Parameter	Conditions	Max	Unit
+Vin to -Vin voltage		-0.5 to 50	V
+Vin to -Vin voltage	< 1 sec	75	V
SYNC to -Vin		-1.2 to 7	V
ON/OFF to -Vin		-0.3 to 7	V
+Vout to -Vout		-0.5 to 20	V
+S to -Vout		-0.5 to 20	V
-S to -Vout		-0.5 to 20	V
TRIM to -Vout		-0.5 to 20	V
Isolation voltage (in to out)		2000	Vrms
Isolation voltage (in to base)		1000	Vrms
Isolation voltage (out to base)		500	Vrms
Storage temperature		-40 to 125	°C
Operating temperature		-20 to 100	°C
Pin soldering temperature	< 5 sec wave solder	260	°C
Pin soldering temperature	< 7 sec hand solder	390	°C

### Electrical Characteristics

Electrical characteristics apply over the full input voltage range, output load and base temperature at the centre, unless otherwise specified.

Module Operating Specifications	Notes	Min	Typ	Max	Unit
Operating input voltage		18	24	36	V
Input surge withstand	< 1 sec			75	V
Operating input current	Input 24V, maximum output power		24.3		A
Output voltage setpoint	Input 18V to 36V, minimum to maximum load	47.66	48	48.33	V
Output OVP setpoint	Non latching	53.27	54.08	54.89	V
Output power	At 100C baseplate temperature			504	W
Efficiency	Nominal input, 75% of full load, 25 Deg C base		88		%

Module Input Specifications	Notes	Min	Typ	Max	Unit
Undervoltage turn-on	Increasing input voltage, +Vin to -Vin		17.3	17.94	V
Undervoltage turn-off	Decreasing input voltage, +Vin to -Vin	14.47	14.9		V
Overvoltage turn-off/on	+Vin to -Vin	37.23	38.3	39.48	V
Dissipation, standby	ON/OFF held low, no load		0.7		W

Module Output Specifications	Notes	Min	Typ	Max	Unit
Line regulation	Low to high input voltage, full load		+1		mV
Load regulation	No load to full load, typical inut		+1		mV
Temperature regulation	Deviation of output voltage from 25C		-0.7		mV/°C
Ripple			78		mVp-p
Current limit	Output voltage 95% of nominal	10.5	11.37	12.32	A
Change of current limit	Output voltage 95% of nominal reducing to 15%		0		A
Short circuit current limit	Crow bar short circuit		3.5	6	A
Power sharing accuracy	Full load		+2	+5	%
Transient response, peak deviation	50% to 100% and 100% to 50% step load change		450		mV
Transient response, settling time	Start of load change return to within 10% of peak deviation		500		us
Remote sense (total drop)	Module can be operated with the +S and -S disconnected			4.77	V
Trim adjustment	Maintaining high efficiency	90		110	%
Trim adjustment range		60		110	%

# Provisional Product Specification



## APC-F501 Full Brick Single Output DC-DC Converter - 24Vi, 48Vo 500W

### Electrical Characteristics (continued)

Module Control Specifications	Notes	Min	Typ	Max	Unit
<b>Primary side</b>					
ON/OFF disable	External open collector or equivalent drive circuit	0	2.4		V
ON/OFF enable	External open collector or equivalent drive circuit		2.7	5	V
ON/OFF driven voltage	External drive source voltage			7	V
ON/OFF enable delay	Delay to 50% output voltage, +Vout to -Vout		2	5	ms
ON/OFF pull up resistance	Internal pull-up resistance to 5V		18k		Ohms
ON/OFF series resistance	Internal pull-down resistance to -Vin when overtemp and O.V. & U.V. tripped		220		Ohms
ON/OFF over temperature (OT) shutdown	Increasing baseplate temperature, center	100	105	110	°C
ON/OFF restart temperature	Decreasing baseplate temperature, center		90		°C
ON/OFF temperature sense voltage	Advance temperature trip warning voltage limits		2.7	4.5	V
ON/OFF temperature sense voltage at 90°C	Advance temperature trip warning @90°C, see applications note for graph	3.25	3.5	3.75	V
ON/OFF temperature sense voltage	Temperature sense voltage prior threshold	2.4		2.7	V
ON/OFF temperature sense voltage	Temperature sense voltage post threshold	1.8		2.4	V
ON/OFF temperature sense voltage	Temperature sense voltage after restart		3.5		
ON/OFF input undervoltage (UV) turn-on	Increasing input voltage, +Vin to -Vin		17.3	17.94	V
ON/OFF input undervoltage (UV) turn-off	Decreasing input voltage, +Vin to -Vin	14.47	14.9		V
ON/OFF input overvoltage (OV) turn-off/on	+Vin to -Vin	37.23	38.3	39.48	V
ON/OFF alarm	UV and OV fault alarm, sink 1.5mA			0.8	V
ON/OFF alarm	OT trip voltage	1.8		2.4	V
SYNC amplitude	External drive source voltage	3	4	7	V
SYNC width	Maximum tr and tf is to be nominally 10% of pulse width	50	100	200	ns
SYNC control range	Single module and multiple modules	320	330	360	kHz
SYNC resistance	Resistance to -Vin		90		Ohms
<b>Secondary side</b>					
SHARE output voltage	Referenced to -S @ maximum output current	1.727	1.87	2.018	V
SHARE current monitor	Referenced to -S	164.5	178.1	192.2	mV/A
SHARE resistance	Output resistance		330		Ohms
TRIM voltage	Referenced to -S	2.487	2.5	2.513	V
TRIM resistance	Internal series resistance		10k		Ohms

**Note:** This power module can be used in a wide variety of applications. To preserve maximum flexibility, internal fusing is not included. However, to achieve maximum safety and system protection, an inline fuse must be used. The safety agencies require a normal-blow, DC fuse with a maximum rating of 20A. The same type fuse with a lower rating can be used in practice.

# Provisional Product Specification

## APC-F501 Full Brick Single Output DC-DC Converter - 24Vi, 48Vo 500W

### General Specification

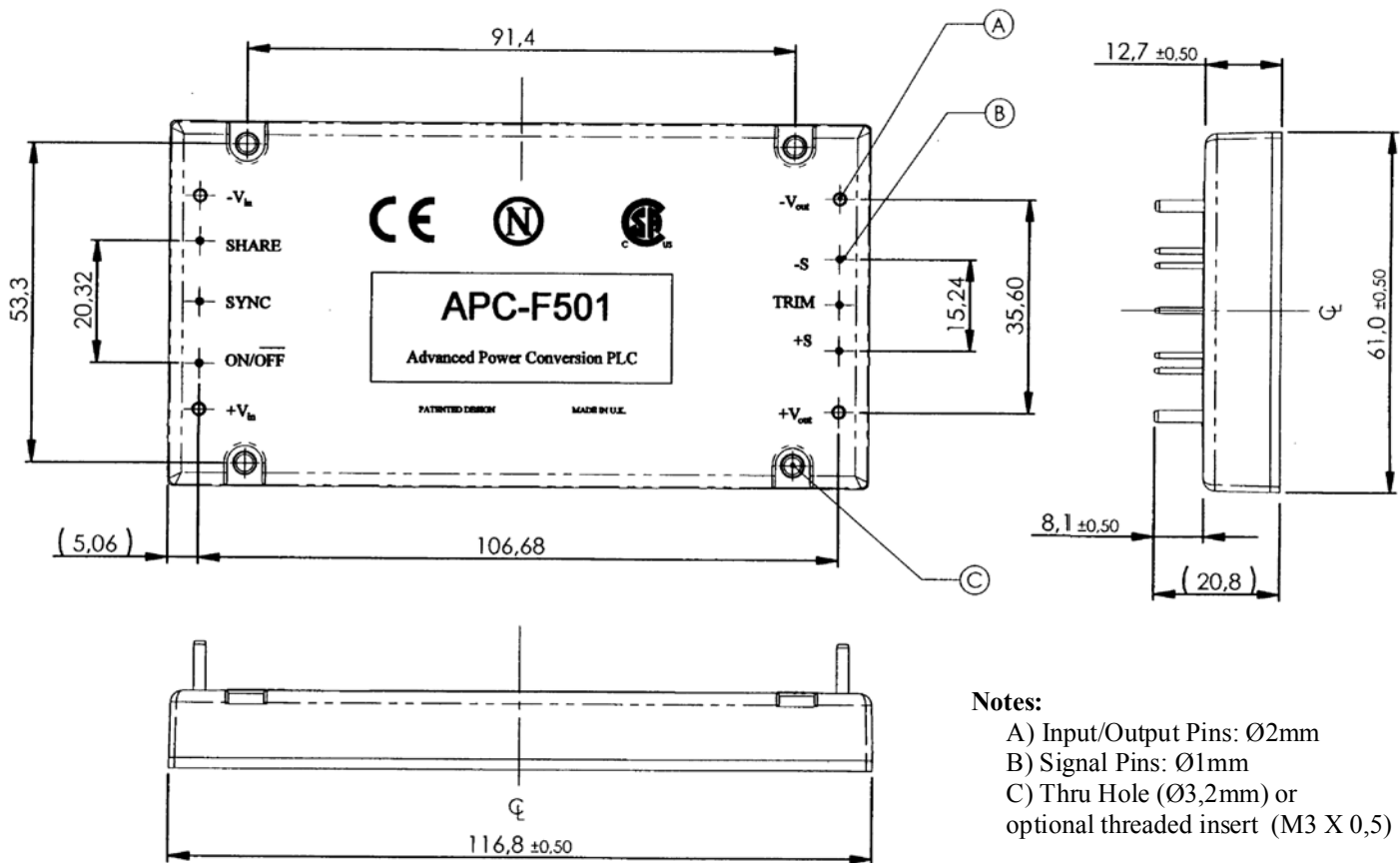
Module Mechanical Specifications	Notes	Min	Typ	Max	Unit
Length			116.8		mm
Width			61		mm
Height			12.7		mm
Thermal resistance	Base to heatsink, fitted with thermal pad		0.1		°C/W
Weight			170		gms

Module General Specifications	Notes	Min	Typ	Max	Unit
Isolation voltage (in to out)	Complies with reinforced insulation requirements	2000			Vrms
Isolation voltage (in to base)	Complies with basic insulation requirements	1000			Vrms
Isolation voltage (out to base)	Complies with operational insulation requirements	500			Vrms
Isolation capacitance	Input to output		470		pF
Isolation resistance	Input to output		10M		Ohms
Agency approvals	Nemko, CSA US & Canada, Others per customer requirement				

Provisional Specification to be verified against the test data

### Mechanical Outline



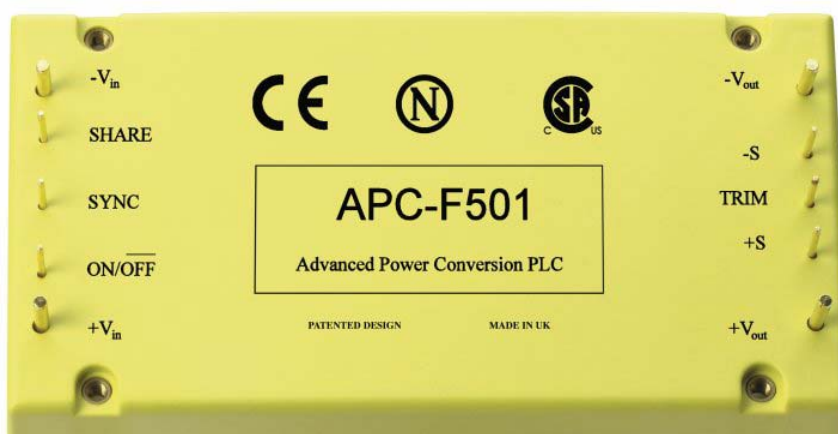
**Notes:**

- A) Input/Output Pins: Ø2mm
- B) Signal Pins: Ø1mm
- C) Thru Hole (Ø3,2mm) or optional threaded insert (M3 X 0,5)

## APC-F501 Full Brick Single Output DC-DC Converter - 24Vi, 48Vo 500W

### Range

Model Reference	Input Voltage (V)	Output Voltage (V)	Output Current (A)
<b>12V input</b>			
APC-F501-012-240	12	24	available soon
APC-F501-012-280	12	28	available soon
APC-F501-012-480	12	48	available soon
<b>24V input</b>			
APC-F501-024-050	24	5	100
APC-F501-024-120	24	12	41.7
APC-F501-024-150	24	15	33.3
APC-F501-024-240	24	24	20.8
APC-F501-024-280	24	28	17.8
APC-F501-024-480	24	48	10.4
<b>48V input</b>			
APC-F501-048-050	48	5	100
APC-F501-048-120	48	12	41.7
APC-F501-048-150	48	15	33.3
APC-F501-048-240	48	24	20.8
APC-F501-048-280	48	28	17.8
APC-F501-048-480	48	48	10.4



Exceeding absolute maximum ratings may cause permanent damage and may reduce reliability. Information and specifications contained in this data sheet are believed to be correct at the time of publication. However, APC accept no responsibility for consequences arising from printing errors or inaccuracies. Specifications are subject to change without notice.