



400W DC-DC Converter

Model No.: ATDSS400U-72 series



Features

1. Ultra-wide input voltage range: 19-120VDC
2. Output Power: 400W (isolated)
3. High efficiency: up to 90%
4. Output voltage: 12.0V, 13.8V, 24.0V, 28.5V
5. IP66 protection grade
6. Six-sided metal shielding, good EMC performance
7. Remote power on/off control
8. Isolation withstand voltage: 1150VAC/1 minute
9. Operating temperature range: -40°C ~ 70°C
10. Compact, multiple installation methods optional
11. Rich protection functions: input under voltage, anti-reverse connection protection, output overvoltage, overcurrent, short circuit protection, over temperature protection.
12. Good for battery load
13. 10-year design lifetime

1. Product Introduction

The ATDSS400U-72 series products are ultra-wide input voltage range, high efficiency, high reliability DC/DC converters designed for off-road engineering machinery and vehicle applications, with a rated power of 400W. The input voltage range of this series of products is 19-120VDC, and multiple models available to cover output voltage range from 12VDC to 28.5VDC.

This series of products has rich protection functions such as input under voltage, input reverse connection protection, output overvoltage, overcurrent, short circuit and over temperature. The product adopts high-reliability industrial-grade glue conformal coating to have three-proofing feature, supports a wide operating temperature range of -40°C to 70°C, has good thermal performance and shock resistance, meets IP66 protection level, and is particularly suitable for applications with high reliability requirements such as off-road engineering machinery and vehicles in harsh environments.

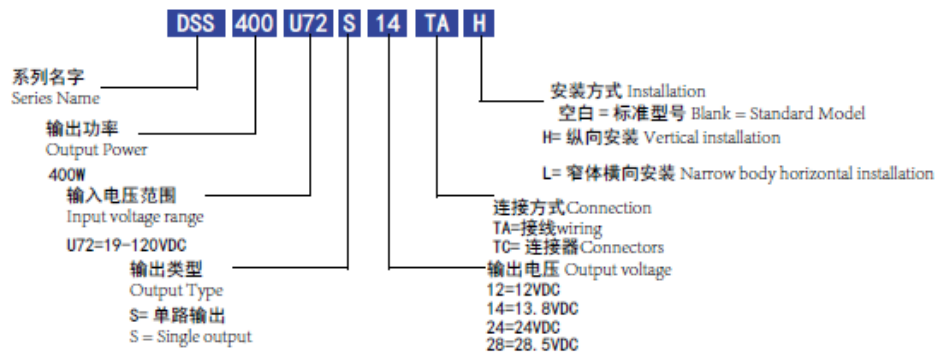
The product design complies with international safety regulations and EMC standards.

Model No.	Rated input voltage [VDC]	Input voltage range [VDC]	Output voltage [VDC]	Output current [A]	Output power [W]	Maximum capacitive load [μ F]	Dimensions
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AT - DSS400U72S12	72	19~120	12.0	33.3	400	5000	160x140x39m m
AT- DSS400U72S14			13.8	29.0			
AT- DSS400U72S24			24.0	16.7			
AT- DSS400U72S28			28.5	14.0			

2. Part number description



3. Specification

Parameter	Remark	Minimum	Typical	Maximum	Unit
Input voltage		19		120	VDC
Disable/enable pin voltage	between input return	0		120	VDC
Operating ambient temperature		-40		70	℃
Storage temperature		-40		85	℃
Storage humidity				90	%Rh
Heat dissipation method	Surface mounted under free air				
Protection level	IP66				
EMC performance					
Radiated disturbance	EN55032	CLASS A			
Electrostatic discharge immunity	IEC/EN61000-4-2	LEVEL 4			
Radiated radio frequency electromagnetic field immunity	EN12895 · IEC/EN61000-4-3	X ^①			
Electrical fast transient pulse group immunity	IEC/EN61000-4-4	LEVEL 1			



Surge (impact) immunity	IEC/EN61000-4-5	LEVEL 1
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Remark :

- ① X : 27-1000MHz 20V/m 80%AM(1kHz) , 1.0-2.0GHz 3V/m 80%AM(1kHz) , 2.0-2.7GHz 3V/m 80%AM(1kHz)

General Features					
Parameter	Remark	Minimum	Typical	Maximum	Unit
Isolation withstand voltage (test time 1 minute)	Input - Output, leakage current <10mA		1150		VAC
	Input - Housing, leakage current <10mA		1500		VDC
	Output - Housing, leakage current <10mA		500		VDC
Insulation resistance (Viso=500VDC)	Input - Output		50		MΩ
Switching frequency			150		KHz
Startup delay				500	ms
Rise time				500	ms
Enable power on/off	Power on: high level or connected to VIN+, power off: floating or connected to VIN-				
Design lifetime			10		Year
Vibration	QC/T 413-2002 - 3.12				
Salt spray	GB/T 2423.17-2008				
Shock	IEC 60068-2-27, Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock				
Input Parameter					
Parameter	Remark	Minimum	Typical	Maximum	Unit
Input voltage range		19	72	120	VDC
Input under voltage protection		13		17	VDC
Input under voltage recovery		15		19	VDC
Input current	19VDC Input			30	A
	72VDC Input			8	A
Input fuse				40	A
Input reverse polarity protection	Built-in input reverse polarity protection				

Output Characteristics (12V Output)					
Parameter	Working conditions	Minimum	Typical	Maximum	Unit
Output power				400	W
Output voltage setting value			12		VDC
Output voltage accuracy		-5		+5	%



Linear regulation rate	19-120VDC input, half load output	-3		+3	%
Load regulation rate	72VDC input	-7		+7	%
Temperature coefficient		-0.02		+0.02	% of Vout /°C
Overall regulation rate		-10		+10	%
Over temperature protection	Case temperature		95		°C
Over temperature recovery	Case temperature		80		°C
Output overvoltage protection			15		VDC
Output overcurrent protection			120		% of Iout
Short circuit protection	Can withstand long-term of short circuit and be able to self-recovery				
Minimum load	No load operation support				
Output current			33.3		A
Output ripple noise①	20MHz bandwidth			360	mV pk-pk
Dynamic load Response	Vout deviation	Load change: 25% - 50% rated load di/dt = 1A/μs	-5	+5	%
	Recovery time			10	ms
Capacitive load		0		5000	μF
Note: ① Ripple and noise are tested under certain filter parameters. For details, please refer to the output ripple and noise in the technical description on section 7.2					

If no special instructions, the parameters are measured under ambient temperature of 25°C, rated input, and full-load output.

Output Characteristics (13.8V Output)					
Parameter	Working conditions	Minimum	Typical	Maximum	Unit
Output power				400	W
Output voltage setting value			13.8		VDC
Output voltage accuracy		-5		+5	%
Linear regulation rate	19-120VDC Input, half load output	-3		+3	%
Load regulation rate	72VDC Input	-7		+7	%
Temperature coefficient		-0.02		+0.02	% of Vout /°C
Overall regulation rate		-10		+10	%
Over temperature protection	Case temperature		95		°C



Over temperature recovery	Case temperature		80		°C
Output overvoltage protection			14.4		VDC
Output overcurrent protection			120		% of Iout
Short circuit protection	Can withstand long-term of short circuit and be able to self-recovery				
Minimum load	No load operation support				
Output current			29		A
Output ripple noise①	20MHz bandwidth			410	mV pk-pk
Dynamic load Response	Vout deviation	Load change: 25% - 50% rated load di/dt = 1A/μs	-5	+5	%
	Recovery time			10	ms
Capacitive load		0		5000	μF
Note: ① Ripple and noise are tested under certain filter parameters. For details, please refer to the output ripple and noise in the technical description on section 7.2					

If no special instructions, the parameters are measured under ambient temperature of 25°C, rated input, and full-load output.

Output Characteristics (24V Output)					
Parameter	Working conditions	Minimum	Typical	Maximum	Unit
Output power				400	W
Output voltage setting value			24		VDC
Output voltage accuracy		-5		+5	%
Linear regulation rate	19-120VDC Input, half load output	-3		+3	%
Load regulation rate	72VDC Input	-7		+7	%
Temperature coefficient		-0.02		+0.02	% of Vout /°C
Overall regulation rate		-10		+10	%
Over temperature protection	Case temperature		95		°C
Over temperature recovery	Case temperature		80		°C
Output overvoltage protection			28		VDC
Output overcurrent protection			120		% of Iout
Short circuit protection	Can withstand long-term of short circuit and be able to self-recovery				
Minimum load	No load operation support				
Output current			29		A



Output ripple noise①		20MHz bandwidth			410	mV pk-pk
Dynamic load Response	Vout deviation	Load change: 25% - 50% rated load di/dt = 1A/μs	-5		+5	%
	Recovery time				10	ms
Capacitive load			0		5000	μF

Note:

- ① Ripple and noise are tested under certain filter parameters. For details, please refer to the output ripple and noise in the technical description on section 7.2 .

If no special instructions, the parameters are measured under ambient temperature of 25°C, rated input, and full-load output.

Output Characteristics (28.5V Output)						
Parameter	Working conditions		Minimum	Typical	Maximum	Unit
Output power					400	W
Output voltage setting value				28.5		VDC
Output voltage accuracy			-5		+5	%
Linear regulation rate	19-120VDC Input, half load output		-3		+3	%
Load regulation rate	72VDC Input		-7		+7	%
Temperature coefficient			-0.02		+0.02	% of Vout /°C
Overall regulation rate			-10		+10	%
Over temperature protection	Case temperature			95		°C
Over temperature recovery	Case temperature			80		°C
Output overvoltage protection				33		VDC
Output overcurrent protection				120		% of Iout
Short circuit protection	Can withstand long-term of short circuit and be able to self-recovery					
Minimum load	No load operation support					
Output current				29		A
Output ripple noise①		20MHz bandwidth			410	mV pk-pk
Dynamic load Response	Vout deviation	Load change: 25% - 50% rated load di/dt = 1A/μs	-5		+5	%
	Recovery time				10	ms
Capacitive load			0		5000	μF

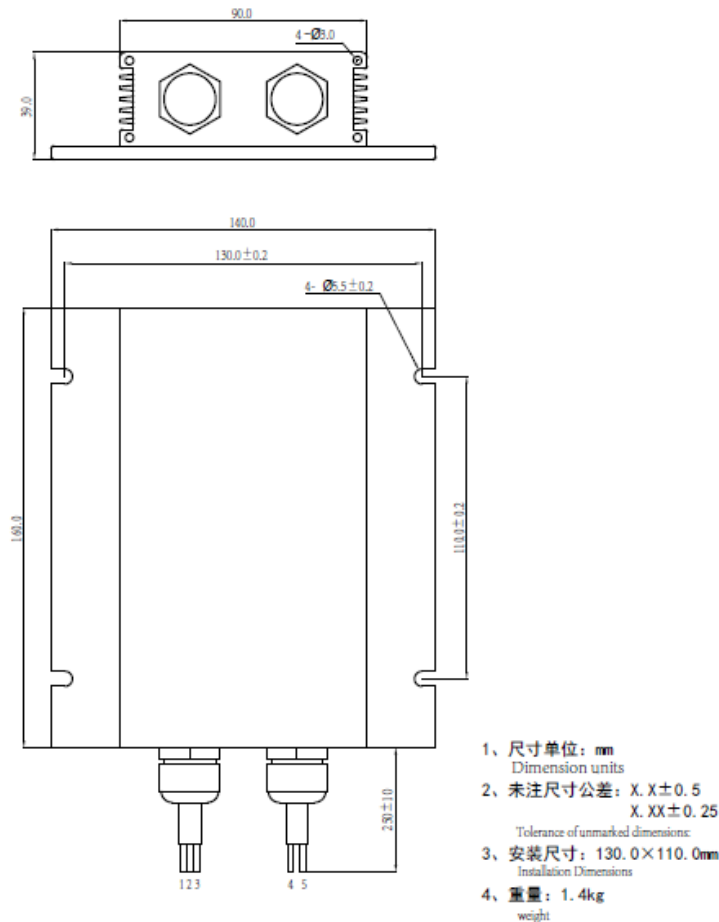
Note:

- ① Ripple and noise are tested under certain filter parameters. For details, please refer to the output ripple and noise in the technical description on section 7.2.



If no special instructions, the parameters are measured under ambient temperature of 25°C, rated input, and full-load output.

4. Structure size / pin definition: standard model



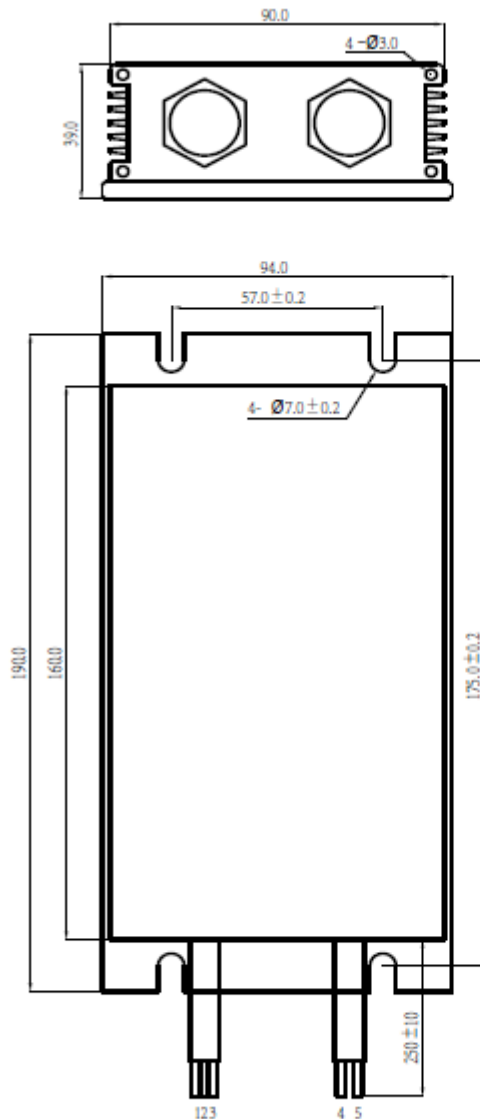
Pin Description (DSS400U72XXXXTA)		
Pins	Function	Wiring diameter
1 (red)	Input positive	9AWG
2 (black)	Input return	9AWG
3 (yellow)	Enable control	14AWG
4 (blue)	Output positive	9AWG
5 (green)	Output return	9AWG

Pin Description (DSS400U72XXXXTC)			
Pins	Function	Connector Model	Wiring diameter
1 (red)	Input positive	DJ70318A-6.3-11 or equivalent model	9AWG
2 (black)	Input return		9AWG
3 (yellow)	Enable control		14AWG
4 (blue)	Output positive	DJ70219Y-7.8-21 or equivalent model	9AWG
5 (green)	Output return		9AWG

Note: DC/DC power supply installation method, input and output leads and terminals can be customized.



5. Structure size / pin definition: "H" model



- 1、尺寸单位: mm
Dimension units
2、未注尺寸公差: X. X ± 0.5
X. XX ± 0.25
Tolerance of unmarked dimensions:
3、安装尺寸: 175.0 × 57.0 mm
Installation Dimensions
4、重量: 1.4 kg
weight

Pin Description (DSS400U72XXXTAH)		
Pins	Function	Wiring diameter
1 (red)	Input positive	9AWG
2 (black)	Input return	9AWG
3 (yellow)	Enable control	14AWG
4 (blue)	Output positive	9AWG

Pin Description (DSS400U72XXXTAH)			
Pins	Function	Connector Model	Wiring diameter
1 (red)	Input positive	DJ70318A-6.3-11 or equivalent model	9AWG
2 (black)	Input return		9AWG
3 (yellow)	Enable control		14AWG
4 (blue)	Output positive	DJ70219Y-7.8-21 or equivalent	9AWG

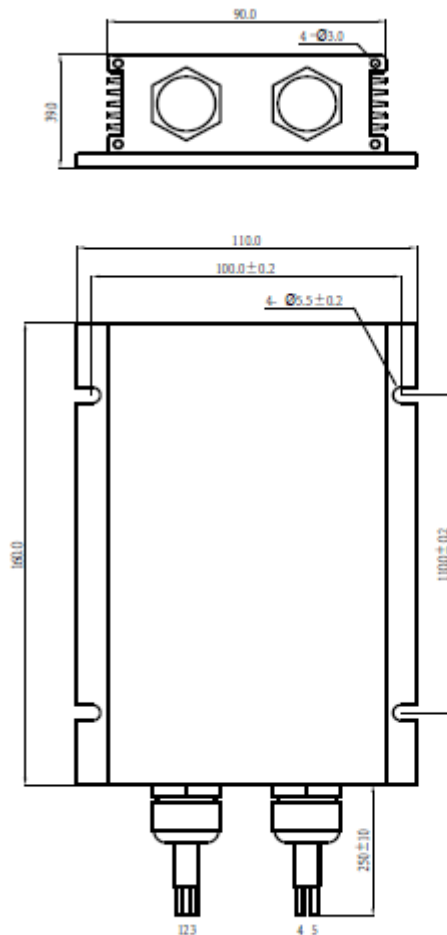


5 (green)	Output return	9AWG
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5 (green)	Output return	model	9AWG
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Note: DC/DC power supply installation method, input and output leads and terminals can be customized.

6. Structure size / pin definition: "L" model



- 1、尺寸单位: mm
Dimension units
2、未注尺寸公差: X. X \pm 0.5
X. XX \pm 0.25
Tolerance of unmarked dimensions
3、安装尺寸: 100.0 \times 110.0mm
Installation Dimensions
4、重量: 1.4kg
weight

Pin Description (DSS400U72XXX TAL)		
Pins	Function	Wiring diameter
1 (red)	Input positive	9AWG
2 (black)	Input return	9AWG
3 (yellow)	Enable control	14AWG
4 (blue)	Output positive	9AWG
5 (green)	Output return	9AWG

Pin Description (DSS400U72XXX TAL)			
Pins	Function	Connector Model	Wiring diameter
1 (red)	Input positive	DJ70318A-6.3-11 or equivalent model	9AWG
2 (black)	Input return		9AWG
3 (yellow)	Enable control		14AWG
4 (blue)	Output positive	DJ70219Y-7.8-21 or equivalent model	9AWG
5 (green)	Output return		9AWG



Note: DC/DC power supply installation method, input and output leads and terminals can be customized.

7. Technical Description

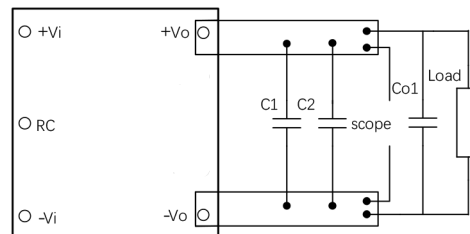
1) Enable control

The power supply has remote enable control. When the enable control line is connected to a high level or VIN+, the power supply is turned on; when the enable control line is left floating or connected to VIN-, the power supply is turned off.

2) Output ripple noise

The test conditions for power supply output ripple noise are rated input voltage, rated output power, oscilloscope bandwidth of 20Mhz, and 10uF and 0.1uF ceramic capacitors are connected in parallel at the output end. The ceramic capacitors are no more than 3 to 5cm away from the power supply output end. Select ceramic capacitors with appropriate rated voltage levels according to the actual output voltage value. For the installation method and position of 10uF and 0.1uF ceramic capacitors, refer to F.

Figure 1 Output ripple noise test



3) Input under voltage protection

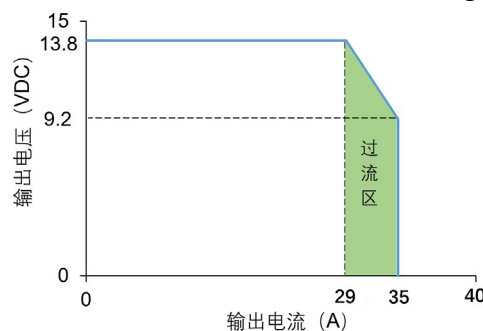
The power supply has an input under voltage protection function. When the input voltage is lower than the under voltage protection point, the power supply automatically shuts down; when the input voltage returns to the under voltage recovery point, the power supply resumes working.

4) Output overcurrent protection

When the output current of the power supply exceeds the overcurrent protection point, the power supply automatically enters the overcurrent protection mode to avoid damage to the power supply due to abnormal external load circuits. Taking 13.8VDC output as an example, the specific overcurrent protection curve is shown in Figure 2. When the current continues to increase, the power supply will enter the output hiccup mode. When the external overcurrent condition disappears, the power supply automatically resumes normal operation.

Figure 2 Output overcurrent protection curve

Note: When the power supply is loaded with batteries, it will charge the batteries with the maximum





current. Please pay attention to the battery charging current.

5) Output short circuit protection

When the power supply output is short-circuited, the power supply automatically enters the short circuit protection mode to avoid damage to the power supply due to short circuit of the external load circuit. The short circuit protection method adopts hiccup protection. When the external short circuit condition disappears, the power supply automatically resumes normal operation.

6) Output overvoltage protection

When the power supply output voltage exceeds the set overvoltage protection point, the power supply automatically enters the overvoltage protection mode to avoid further damage to the power supply and external circuits. The overvoltage protection method is to shut down the output. When the output overvoltage condition disappears, the power supply automatically resumes normal operation.

7) Over temperature protection

The power supply is equipped with an over temperature protection detection element to prevent the power supply from being damaged due to excessive operating temperature. When the temperature exceeds the set over temperature protection point, the power supply turns off the output. When the power supply temperature is lower than the set hysteresis temperature, the power supply automatically resumes normal operation.

8) Thermal performance reference

During the thermal curve test, the power module was placed on a 250x300x5mm aluminum substrate, as shown in Figure 3.

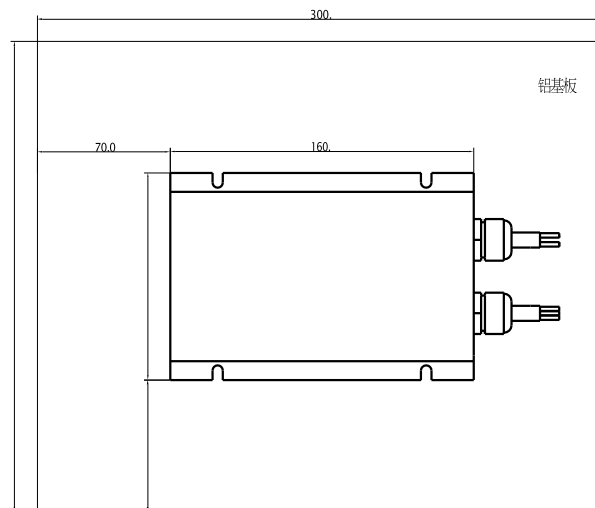


Figure 3 Thermal de-rating test diagram



As shown in Figure 4, the power module works continuously for 2 hours at 90% load at an ambient temperature of 60°C. The temperature of the power module remains almost constant and does not enter the over-temperature protection state.

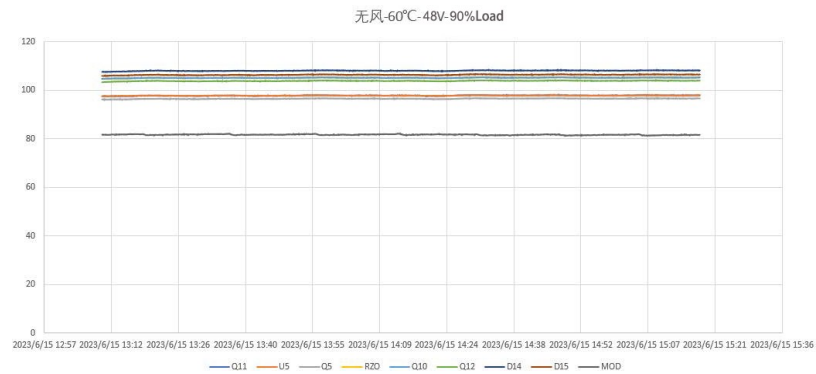


Figure 4 Thermal performance test (free air 60°C; 48Vin,90% load)