

500UFR Series

Distributed By:
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Key Features:

- 4:1 Ultra-Wide Input Voltage Range
- High Efficiency
- Continuous Short Circuit Protection
- Six-Sided Continuous Shielding
- Low Profile 2 x 2 x 0.4 Inch Case
- Low Cost

General Description

The 500UFR series is a family of cost effective 5W single & dual output DC/DC converters. High performance features include an ultra-wide 4:1 input voltage range, high efficiency operation, continuous short circuit protection with automatic restart and an input π (Pi) filter to reduce reflected ripple current. Twelve models operate from inputs of 9 to 36 VDC or 18 to 72 VDC and provide output voltage levels of 5, 9, 12, 15, ± 12 or ± 15 VDC. Standard features include 500 VDC input/output isolation, tight line/load regulation, $\pm 1\%$ output voltage accuracy and low noise operation.

All models are packaged in a compact, low profile 2.0 x 2.0 x 0.4 inch case. Operation is specified over the operating temperature range of -25°C to $+71^{\circ}\text{C}$ with no derating required. Cooling is by free-air convection.

Electrical Specifications

Input Specifications:

Input Voltage Range	4:1, See Table 1
Input Filter	π (Pi) Network
Reverse Voltage Protection	Parallel Diode
Reflected Ripple Current	See Model Selection Guide

Output Specifications:

Output Voltage and Current ⁽¹⁾	See Model Selection Guide
Output Voltage Accuracy	$\pm 1\%$, Max.
Voltage Balance (Dual Outputs)	$\pm 1\%$, Max.
Ripple & Noise (20 MHz BW)	10 mV RMS, Max. 100 mV Pk-Pk, Max.
Line Regulation	$\pm 0.2\%$, Max.
Load Regulation	$\pm 0.5\%$, Max.
Minimum Load ⁽²⁾	10% of Full Load
Temperature Coefficient @ FL	$\pm 0.02\%/^{\circ}\text{C}$
Transient Response	$< 500 \mu\text{Sec}$.
Short Circuit Protection	Current Limit, Continuous
Short Circuit Restart	Automatic

General Specifications:

Efficiency	See Model Selection Guide
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Isolation Voltage (1 min)	500 VDC, Min.
Isolation Capacitance	600 pF
Isolation Resistance	$10^9 \Omega$
Switching Frequency	80 - 120 kHz

Environmental Specifications:

Operating Temperature Range (Ambient)	-25°C to $+71^{\circ}\text{C}$
Storage Temperature Range	-40°C to $+105^{\circ}\text{C}$
Derating	None Required
Humidity	Up to 95%, Non-Condensing
Cooling ⁽³⁾	Free-air Convection

Physical Characteristics:

Size	2.0 x 2.0 x 0.4 inches (50.8 x 50.8 x 10.2 mm)
Weight	2.8 Oz (79g)
Case Material ⁽⁴⁾	Black Coated Metal

Absolute Maximum Ratings:⁽⁵⁾

Input Voltage	175% of Nominal Input Line
Output Short Circuit Duration	Continuous
Internal Power Dissipation	3.0W

Specifications typical @ $+25^{\circ}\text{C}$ with nominal input voltage and under full output load conditions, unless otherwise noted. Specifications subject to change without notice.

Specification Notes

1. Total output power should not exceed the specified output ratings for any particular model.
2. A minimum load of 10% is required on each output for dual output models
3. Free-air convection cooling requires that the application be properly ventilated. Using a converter in a sealed application, or one in which air movement is severely restricted, could cause thermal runaway.
4. To reduce EMI, the case header is soldered to the "cup" that the unit sits in. This provides a six-sided, continuous shield that effectively blocks radiated emissions.
5. Absolute Maximum Ratings are specification limits that, if exceeded, could permanently damage the unit. These are not continuous operating ratings.

Note:
For information on the standard conditions and methods used or approved by CDI to test DC/DC converter parameters, see the application note "DC/DC Converter Test Methods" on page 104.

Model Selection Guide

Model Number	Input				Reflected Ripple (mA P-P)	Output		Efficiency @FL (%)
	Voltage (VDC)		Current (mA, Max.)			Voltage (VDC)	Current (mA)	
	No-Load	Full-Load	No-Load	Full-Load				
505S24UFR	24	9 - 36	20	300	30	5	1000	70
509S24UFR	24	9 - 36	20	290	29	9	550	71
512S24UFR	24	9 - 36	20	340	34	12	500	74
515S24UFR	24	9 - 36	20	340	34	15	400	74
512D24UFR	24	9 - 36	25	340	34	±12	±250	74
515D24UFR	24	9 - 36	25	335	34	±15	±200	75
505S48UFR	48	18 - 72	20	145	15	5	1000	72
509S48UFR	48	18 - 72	20	142	15	9	550	73
512S48UFR	48	18 - 72	20	167	17	12	500	75
515S48UFR	48	18 - 72	20	167	17	15	400	75
512D48UFR	48	18 - 72	15	167	17	±12	±250	75
515D48UFR	48	18 - 72	15	167	17	±15	±200	75

Application Notes:

1. Modules with ±12 VDC or ±15 VDC outputs may be connected to provide 24 VDC or 30 VDC respectively. For example, to connect the **512D24UFR** for -24 VDC operation, ground the -V input (pin 2), and connect it to the +V output (pin 3). With this reference, -24 VDC will be available at the -V output (pin 5) and -12 VDC will be available at common (pin 4).
2. These units operate as complete modules with no need for external components. However, in some noise sensitive analog applications it is recommended that a 15 µF - 25V tantalum electrolytic capacitor be placed in parallel with a 0.1 µF ceramic capacitor as close to the load as possible. This will reduce ripple to approximately 5 mV Pk-Pk.
3. Start up voltage is the minimum input required for the unit to operate. However, the unit may not meet all specifications if operated below the input voltage range given in Table 1.

Table 1 - Input Voltage Range vs Output Load

Nominal Input (VDC)	Input Voltage Range (VDC) at:			
	20% Load	40% Load	60% Load	100% Load
24	8.70 - 40.9	8.75 - 39.5	8.81 - 37.1	9.0 - 36.0
48	17.2 - 81.8	17.5 - 79.1	17.6 - 74.2	18.0 - 72.0

Table 2 - Start-up Voltage (See application note 3)

Nominal Input (VDC)	Start Up Voltage (VDC)		
	Min.	Typ.	Max.
24	8.7	9.0	9.25
48	12.5	14.0	18.0

Pin-Out

Pin	Single Output	Dual Output
1	+V Input	+V Input
2	-V Input	-V Input
3	+V Output	+V Output
4	N/C	Common
5	-V Output	-V Output

Note: All dimensions are typical in inches (mm).
Tolerance: X.XX = ± 0.02, (± 0.05)
X.XXX = ± 0.010, (± 0.25)
N/C = No Connection

Mechanical Configuration:

