100FR, 200FR and 300FR Series

Distributed By:
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- **24 Pin DIP Package**
- **7.5W/In³ Power Density**
- **48 Models**
- **Continuous Short Circuit Protection**
- **Internal π (Pi) Filter**
- **Low Cost**

General Description

The **100FR**, **200FR** and **300FR** series are a family of cost effective, yet high performance 1W, 2W and 3W DC/DC converters. These converters combine miniature packaging in a 24-pin DIP compatible case with high performance features such as 500 VDC input/output isolation voltage, continuous short circuit protection with automatic restart and tight line/load regulation. Forty eight models offer a wide selection of power, package, inputs and outputs. Units operate from power busses of 5, 12, 24 or 48 VDC and provide output voltage levels of 5, 12, 15, ±12 or ±15 VDC. Standard features include an internal π (Pi) filter to reduce reflected ripple current, output voltage balance of ±3% (for dual output units) and low noise operation. Each **100FR** model is packaged in a low profile 1.27 x 0.62 x 0.40 inch 24 pin DIP case. All **200FR** and **300FR** units are packaged in a compact 1.25 x 0.80 x 0.40 inch case that is 24 pin DIP compatible. This miniature size yields a power density of 7.5 W/In³. Operation is specified over the full operating temperature range of -25˚C to +71˚C with no derating required. Cooling is by free air convection.

Electrical Specifications

Input Specifications:

Input Voltage Range ..... See Table 1
Input Filter ..... LC Filter
Reflected Ripple Current. ..... See Model Selection Guide

Output Specifications:

Output Voltage and Current [1] ..... See Model Selection Guide
Output Voltage Accuracy ..... ±5%, Max.
Voltage Balance (Dual Outputs) ..... ±3%, Max.
Ripple & Noise (20 MHz BW) ..... 50 mV Pk-Pk, Max.
Line Regulation ..... ±0.5%, Max.
Load Regulation ..... ±0.5%, Max.
Minimum Load ..... 10% of Full Load
Temperature Coefficient @ FL ..... ±0.02%/°C
Short Circuit Protection ..... Continuous
Short Circuit Restart ..... Automatic

General Specifications:

Efficiency ..... See Model Selection Guide
Isolation Voltage (1 min)[4] ..... 500 VDC, Min.
Isolation Resistance ..... $10^9\Omega$
Isolation Capacitance 100pF
Switching Frequency ..... >100 kHz

Environmental Specifications:

Operating Temperature Range (Ambient) ..... -25°C to +71°C
Storage Temperature Range ..... -40°C to +125°C
Derating ..... None Required
Humidity ..... Up to 95%, Non-Condensing
Cooling [2] ..... Free-air Convection

Physical Characteristics:

Size; 100FR Models ..... 1.27 x 0.62 x 0.4 inches (32.3 x 15.7 x 10.2 mm)
200/300FR Models ..... 1.25 x 0.80 x 0.40 inches (31.8 x 20.3 x 10.2mm)
Weight ..... 0.5 Oz (14g)
Case Material ..... Non-Conductive Black Plastic

Absolute Maximum Ratings: [3]

Input Voltage ..... 130% of Nominal Input Line
Output Short Circuit Duration ..... Continuous
Internal Power Dissipation;
100FR 1.5W
200FR 2.5W
300FR 3.0W

Specifications typical @ +25°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. 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.
3. Absolute Maximum Ratings are specifications that, if exceeded, could permanently damage the unit. These are not continuous operating ratings.
4. Please consult factory for versions with 1400 VDC isolation and agency approvals.

Model Selection Guide - 100FR Series

Model Number	Input				Output		Efficiency @FL (%)
	Nominal Voltage (VDC)	Current (mA) No-Load	Current (mA) Full-Load	Reflected Ripple (mA P-P)	Voltage (VDC)	Current (mA)	
105S5FR	5	55	220	22	5	100	45
112S5FR	5	70	340	34	12	80	56
115S5FR	5	70	340	34	15	65	57
112D5FR	5	80	360	36	±12	±40	53
115D5FR	5	90	360	36	±15	±33	55
105S12FR	12	55	90	9	5	100	46
112S12FR	12	70	140	14	12	80	57
115S12FR	12	70	150	15	15	65	54
112D12FR	12	80	150	15	±12	±40	53
115D12FR	12	90	150	15	±15	±33	55

Table 1 - Input Voltage Range vs Output Load

Nominal Input (VDC)	Input Voltage Range (VDC) at: 20% Load	40% Load	60% Load	100% Load
5	4.11 - 6.43	4.26 - 6.22	4.41 - 5.86	4.50 - 5.50
12	9.88 - 15.37	10.23 - 14.86	10.57 - 14.00	10.80 - 13.20
24	19.76 - 30.93	20.45 - 29.90	21.14 - 28.16	21.60 - 26.40
48	39.56 - 61.87	40.93 - 59.81	42.30 - 56.32	43.20 - 52.80

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100FR, 200FR and 300FR Series

Model Selection Guide - 200FR Series

Model Number	Input				Output		Efficiency @FL (%)
	Nominal Voltage (VDC)	Current (mA)		Reflected Ripple (mA P-P)	Voltage (VDC)	Current (mA)	
		No-Load	Full-Load				
205S5FR	5	100	800	80	5	400	50
212S5FR	5	100	730	73	12	165	54
215S5FR	5	100	690	69	15	133	57
212D5FR	5	100	740	74	±12	±83	53
215D5FR	5	100	770	77	±15	±66	51
205S12FR	12	40	330	33	5	400	50
212S12FR	12	40	295	30	12	165	56
215S12FR	12	35	265	27	15	133	62
212D12FR	12	35	280	28	±12	±83	59
215D12FR	12	35	280	28	±15	±66	59
205S24FR	24	20	163	17	5	400	51
212S24FR	24	20	135	14	12	165	61
215S24FR	24	20	135	14	15	133	61
212D24FR	24	20	135	14	±12	±83	61
215D24FR	24	20	135	14	±15	±66	61
205S48FR	48	10	83	9	5	400	50
212S48FR	48	10	70	7	12	165	59
215S48FR	48	10	70	7	15	133	59
212D48FR	48	10	80	8	±12	±83	51
215D48FR	48	10	80	8	±15	±66	51

Model Selection Guide - 300FR Series

Model Number	Input				Output		Efficiency @FL (%)
	Nominal Voltage (VDC)	Current (mA)		Reflected Ripple (mA P-P)	Voltage (VDC)	Current (mA)	
		No-Load	Full-Load				
305S5FR	5	120	1000	100	5	600	60
312S5FR	5	120	960	96	12	250	62
315S5FR	5	120	960	96	15	200	62
312D5FR	5	120	1000	100	±12	±125	60
315D5FR	5	120	1000	100	±15	±100	60
305S12FR	12	50	420	42	5	600	60
312S12FR	12	50	400	40	12	250	62
315S12FR	12	50	400	40	15	200	62
312D12FR	12	50	420	42	±12	±125	60
315D12FR	12	50	420	42	±15	±100	60
305S24FR	24	25	210	21	5	600	60
312S24FR	24	25	195	20	12	250	64
315S24FR	24	25	195	20	15	200	64
312D24FR	24	25	210	21	±12	±125	60
315D24FR	24	25	210	21	±15	±100	60
305S48FR	48	15	105	11	5	600	60
312S48FR	48	15	100	10	12	250	62
315S48FR	48	15	100	10	15	200	62

Pin-Out 200FR & 300FR

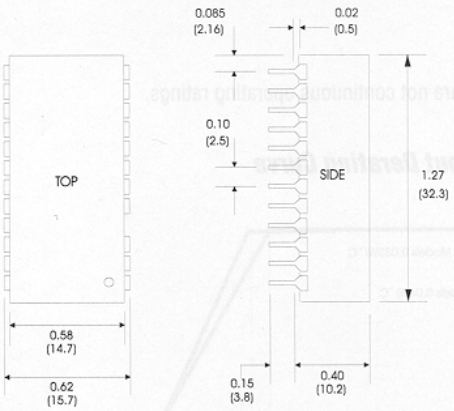
Pin	Single Output	Dual Output
1	+V Input	+V Input
2	N/C	-V Output
3	N/C	Common
10	-V Output	Common
11	+V Output	+V Output
12	-V Input	-V Input
13	-V Input	-V Input
14	+V Output	+V Output
15	-V Output	Common
22	N/C	Common
23	N/C	-V Output
24	+V Input	+V Input

Application Notes:

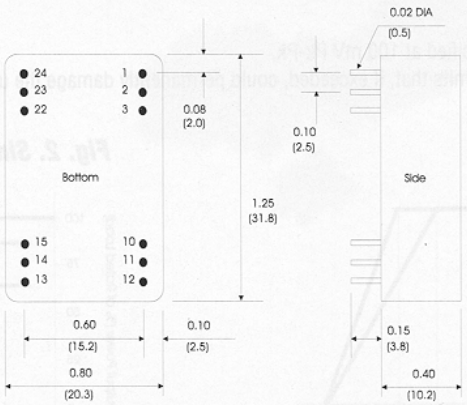
1. Modules with ±12 VDC or ±15 VDC outputs may connected to provide 24 VDC or 30 VDC respectively. For example, to connect the **212D24FR** for -24 VDC operation, ground the -V input (pins 12 & 13) and connect it to the +V output (pins 11 & 14). With this reference, -24 VDC will be available at the -V output (pins 2 & 23) and -12 VDC will be available at common (pins 3, 10, 15 & 22).
2. On dual output units, the outputs are not isolated from each other (see pin connection diagram).
3. 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 the converter output ripple to approximately 5 mV Pk-Pk.
4. The use of a ground plane under the converter is recommended for heat sinking and to reduce EMI.

Note: All dimensions are typical in inches (mm).
Tolerance: X.XX = ± 0.02, (± 0.5)
X.XXX = ± 0.010, (± 0.25)
N/C = No Connection
Pin #1 may be designated by a dot on the top of the case

Mechanical Configuration - 100FR



Mechanical Configuration - 200/300FR



Pin-Out 100FR