



# FRD6-00

## DC-DC Converter Input Filter

Bel Power Solutions FRD6-00 Input Filter helps control EMC immunity and emission in board-level DC-DC converter applications, minimizing the conducted and radiated emissions generated by switch mode DC-DC converters.

The FRD6-00 allows board designs utilizing DC-DC converters to meet stringent EMC requirements according to railway industry standards.



<sup>1</sup> Pending



### Key Features & Benefits

- Ultra-Wide input voltage range: 14 -160 VDC
- Maximum operating current 0.8 A
- Operating ambient temperature range -40 °C to +105 °C
- Small footprint
- Meet IEC/EN 61000-4 series standards and CISPR16 / EN 55032
- Meet railway industry EN 50155 / EN 50121-3-2 and AREMA standards
- In compliance with the latest revision of the safety standard IEC 62368-1

### Applications

- Railway related equipment

## 1. MODEL SELECTION

PART NUMBER	INPUT VOLTAGE RANGE [VDC]	RATED CURRENT [A]
FRD6-00	14 – 160	0.8

## 2. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage Range		14	110	160	VDC
Transient Maximum Voltage	1 s	–	–	200	VDC

## 3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Current		–	–	0.8	A

## 4. GENERAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Temperature		-40	–	105	°C
Storage Temperature		-55	–	125	°C
Storage Humidity		5	–	95	%RH
MTBF	MIL-HDBK-217F @ 25 °C	1000	–	–	kh

## 5. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION
Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimension	31.60 x 20.30 x 12.50 mm
Weight	10 g (Typ.)

## 6. ELECTROMAGNETIC COMPATIBILITY (EN50121-3-2)

PARAMETER	DESCRIPTION	CLASS / CRITERIA	
Emission <sup>1</sup>	CE EN 55016-2-1	150 kHz – 500 kHz; 79 dBuV (see Fig. 1 for recommended circuit) 500 kHz – 30 MHz; 73 dBuV (see Fig. 1 for recommended circuit)	
	RE CISPR16-2-3	30 MHz – 230 MHz; 40 dBuV/m at 10 m (see Fig. 1 for recommended circuit) 230 MHz – 6 GHz; 47 dBuV/m at 10 m (see Fig. 1 for recommended circuit)	
Immunity	ESD EN 61000-4-2	Contact ±6 kV/Air ±8 kV	perf. Criteria A
	RS EN 61000-4-3	80 – 800 MHz; 20 V/m 800 – 1000 MHz; 20 V/m 1400 – 2000 MHz; 10 V/m 2000 – 2700 MHz; 5 V/m 5100 – 6000 MHz; 3 V/m	perf. Criteria A
	EFT EN 61000-4-4	±2 kV; 5/50 ns; 5 kHz (see Fig. 1 for recommended circuit)	perf. Criteria A
	Surge EN 61000-4-5	Line to line ±1 kV (42 Ω, 0.5 μF) (see Fig. 1 for recommended circuit) Line to line ±1 kV (2 Ω, 18 μF) (see Fig. 1 for recommended circuit)	perf. Criteria A
	CS EN 61000-4-6	0.15 MHz – 80 MHz 10 V r.m.s	perf. Criteria A

<sup>1</sup> Corresponds or exceeds EN 50121-3-2

## 7. ELECTROMAGNETIC COMPATIBILITY (AREMA)

PARAMETER	DESCRIPTION	CLASS / CRITERIA	
Emissions	CE CISPR16-2-1 CISPR16-1-2	150 kHz – 500 kHz; 79 dBuV (see Fig. 1 for recommended circuit) 500 kHz – 30 MHz; 73 dBuV (see Fig. 1 for recommended circuit)	CLASS A
	RE CISPR16-2-3	30 MHz – 230 MHz; 40 dBuV/m at 10 m (see Fig. 1 for recommended circuit) 230 MHz – 1 GHz; 47 dBuV/m at 10 m (see Fig. 1 for recommended circuit)	CLASS A
Immunity	ESD IEC 61000-4-2	Contact ±6 kV/Air ± 8 kV	perf. Criteria A
	RS IEC 61000-4-3	80 – 1000 MHz; 10 V/m 160 – 165 MHz; 20 V/m 450 – 470 MHz; 20 V/m 800 – 960 MHz; 20 V/m 1400 – 2000 MHz; 20 V/m 2100 – 2500 MHz; 5 V/m	perf. Criteria A
	EFT IEC 61000-4-4	±2 kV 5/50 ns; 5 kHz (see Fig. 1 for recommended circuit)	perf. Criteria A
	Surge IEC 61000-4-5	Line to line ±2 kV (2 Ω, 18 μF) (see Fig. 1 for recommended circuit)	perf. Criteria A
	CS IEC 61000-4-6	0.15 MHz-80 MHz; 10 V r.m.s	perf. Criteria A
	MS IEC 61000-4-8 IEC 61000-4-8	60 Hz; 100 A/m (see Fig. 1 for recommended circuit) 60 Hz; 300 A/m (see Fig. 1 for recommended circuit)	perf. Criteria A

**8. DESIGN REFERENCE**  
**TYPICAL APPLICATION**

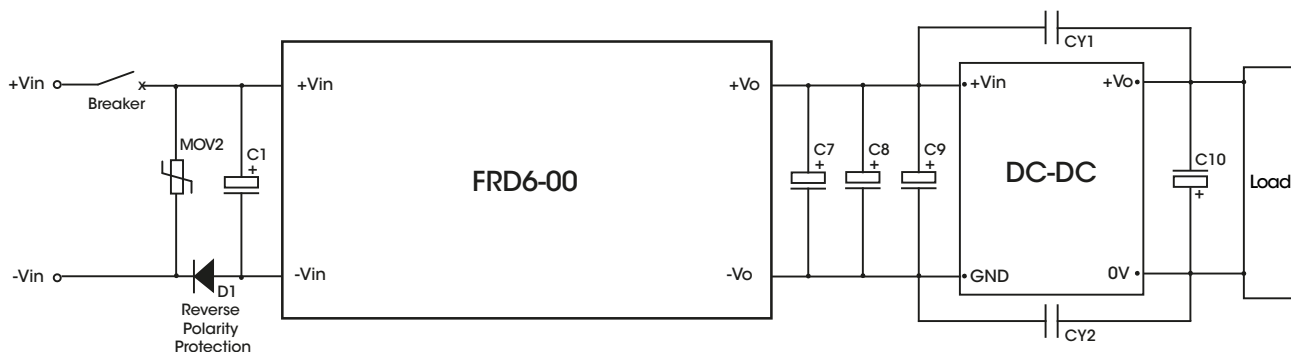



Figure 1. Recommended EMC Filtering

COMPONENTS	VALUE	RECOMMENDED COMPONENT
C1	330 $\mu$ F	ELECTROLYTIC; Al, WET; RADIAL; 330 $\mu$ F; 20%; 250 V; $\varnothing$ 18 x 30 mm; PITCH 7.5 mm; -40 to +105°C
C7, C8, C9	100 $\mu$ F	ELECTROLYTIC; Al, WET; RADIAL; 100 $\mu$ F; 20%; 250 V; $\varnothing$ 16 x 20 mm; PITCH 7.5 mm; -40 to +105°C
CY1, CY2	2.2 nF	CERAMIC; X1/Y1; 2.2 nF; 10%; 400 V; PITCH 10 mm; -40 to +125°C
D1	2 A	SCHOTTKY; DUAL; 600 V; 2 A; Vf 1.1 V; DO-15; -50 to +150°C; COMMON CATHODE
MOV2	220 V / 58 J	VDR; 220 V; 4 kA; 58 J; THT; PITCH 7.5 mm; -40 to +85°C
Fuse or Breaker <sup>2</sup>	2 A	Type C

<sup>1</sup> Type of fuse / circuit breaker to be selected according to the application requirements. The current rating shall be above the maximum working input current and below rated working current of reverse polarity diode.

## 9. MECHANICAL SPECIFICATIONS

THIRD ANGLE PROJECTION 

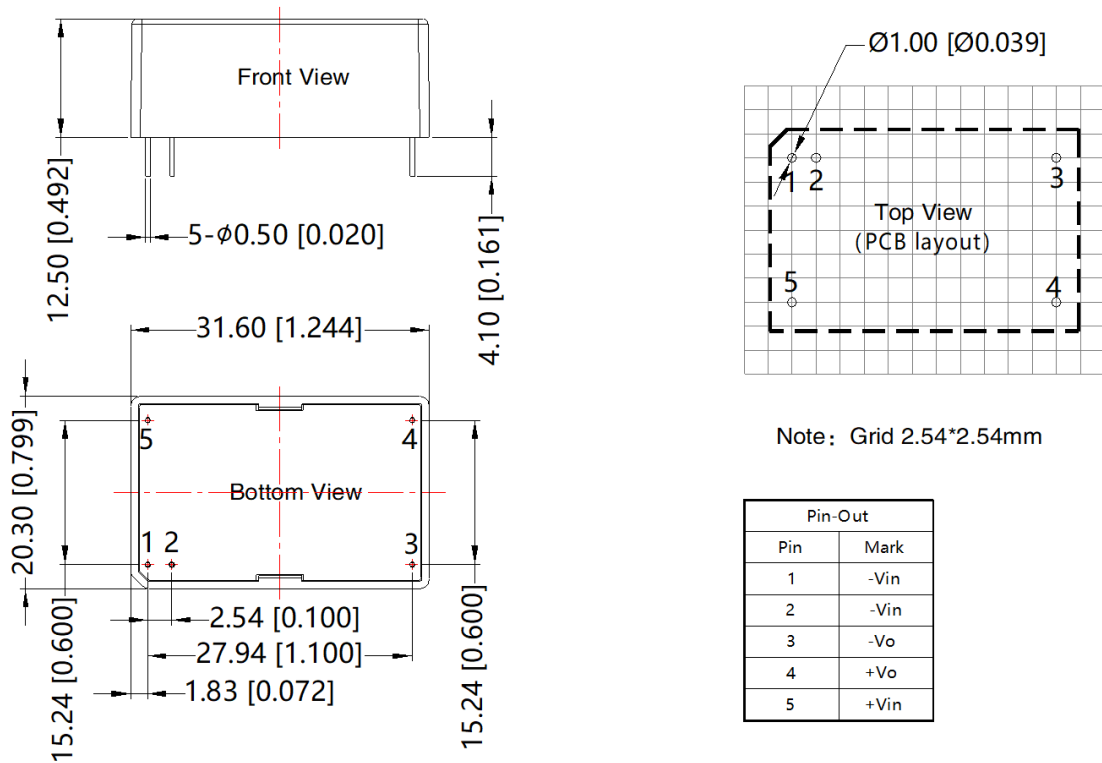


Figure 3. Mechanical drawing

For more information on these products consult: [tech.support@psbel.com](mailto:tech.support@psbel.com)

**NUCLEAR AND MEDICAL APPLICATIONS** - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

**TECHNICAL REVISIONS** - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.