MR1011S_{Series} Direct CONVERTER DC/DC CONVERTER MODEL:MR10115.05RU wat 75.12RU

Electrical Specifications

Ultra-Wide Input, 10W Compact, Railway DC/DC Converters

Key Features:

- 10W Output Power
- 40 160 VDC Input Range
- Meets EN 60950, EN 50155
- 1,500 VDC Isolation
- Efficiency to 86%
- Compact 1 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Chassis Mount Option
- DIN Rail Mount Option

	RoHS
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MicroPower Direct

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Chassis Mount Adapter See Mechanical Diagram (Page 4 DIN Rail Mount Adapter See Mechanical Diagram (Page 4 Reliability Specifications See Mechanical Diagram (Page 4	ParameterConditionsInput Voltage Range	40.0 (Pi) Filter Min. 1ax 0% e 1 e 1 e 1 110 s (Autorece	110.0 Typ. ±1.0 ±0.2 ±0.5 15 60 500 ±3.0 120 ±0.03	160.0 40.0 Max. ±2.0 ±0.5 ±1.0 30 100 1,000 ±5.0	VDC VDC Units % % % mV P - P mV P - P μS % %		
Input Voltage Range 40.0 110.0 160.0 VDC Input Start Voltage m m Mm VDC VDC Input Filter m m Typ. Max. Units Output Voltage Accuracy input Filter Min. Typ. Max. Units Codupt Voltage Accuracy input Filter m ±0.5 ±1.0 % Line Regulation Iour = 10% to 100% ±0.5 ±1.0 % Ripple (20 MHz) See Note 1 50 11.0 % Ripple (20 MHz) See Note 1 60 100 mV P - P Transient Recovery Time, See Note 2 25% Load Step Change ±3.0 ±5.0 % Transient Response Deviation 110 120 140 % % % Coutput Short Circuit, See Note 3 Continuous (Autorecurstrustrustrustrustrustrustrustrustrust	Input Start Voltage Input Filter Output Parameter Conditions Dutput Voltage Accuracy Line Regulation Load Regulation VIN = Min to N Load Regulation Ripple (20 MHz) ViN = Min to 100 See Not Noise (20 MHz) See Note 2 Transient Recovery Time, See Note 2 Transient Response Deviation Dutput Power Protection Femperature Coefficient Output Short Circuit, See Note 3 Continuou	(Pi) Filter Min. Max D% e 1 e 1 e 1 e 1 e 1 s (Autoreco	110.0 Typ. ±1.0 ±0.2 ±0.5 15 60 500 ±3.0 120 ±0.03	40.0 Max. ±2.0 ±0.5 ±1.0 30 100 1,000 ±5.0	VDC Units % % mV P - P mV P - P μS % %		
Input Start Voltage Input Start Voltage VDC Input Filter π (P) Filter Output Typ. Max. Units Parameter Conditions Min. Typ. Max. Units Output Voltage Accuracy Imput Start Voltage Imput Start Vo	Input Start Voltage Input Filter Output Parameter Conditions Dutput Voltage Accuracy Line Regulation Load Regulation VIN = Min to N Load Regulation Ripple (20 MHz) ViN = Min to 100 See Not Noise (20 MHz) See Note 2 Transient Recovery Time, See Note 2 Transient Response Deviation Dutput Power Protection Femperature Coefficient Output Short Circuit, See Note 3 Continuou	Min. Max D% e 1 e 1 nge 110 us (Autoreco	±1.0 ±0.2 ±0.5 15 60 500 ±3.0 120 ±0.03	Max. ±2.0 ±0.5 ±1.0 30 100 1,000 ±5.0	Units % % % mV P - P mV P - P μS %		
Input Filter π (Pi) FilterOutputParameterConditionsMin.Typ.Max.UnitsOutput Voltage AccuracyVIN = Min to Max ± 1.0 ± 2.0 %Line RegulationIour = 10% to 100% ± 0.5 ± 1.0 $\# 2.0$ Load RegulationIour = 10% to 100% ± 0.5 ± 1.0 $\# 2.0$ Ripple (20 MHz)See Note 11530mV P - PNoise (20 MHz)See Note 160100 $\# V P - P$ Transient Response Deviation25% Load Step Change ± 3.0 ± 5.0 $\# 0.7$ Output Power Protection110120140 $\# 0.7$ Transient Response Deviation110120140 $\# 0.7$ Output Short Circuit, See Note 3Continuous (Autorecovery) $\# 0.7$ $\# 0.7$ GeneralConditionsMin.Typ.Max.UnitsIsolation Voltage60 Seconds1,500VDCM $\Omega 0$ Isolation Capacitance500 VDC1,000 $\# 1.0$ $\# 2.4$ Switching Frequency350kHzEnvironmentalParameterConditionsMin.Typ.Max.UnitsSolation CapacitanceSol Whz/0.1V1,000 $\# 2.4$ $\# 3.0^{\circ} C^{\circ} C^{\circ}$	Input Filter π Output Parameter Conditions Dutput Voltage Accuracy Line Regulation VIN = Min to M Load Regulation Ioυτ = 10% to 100 Ripple (20 MHz) See Note 100 Noise (20 MHz) See Note 2 Transient Recovery Time, See Note 2 Transient Response Deviation Dutput Power Protection Femperature Coefficient Dutput Short Circuit, See Note 3 Continuou	Min. Max D% e 1 e 1 nge 110 us (Autoreco	±1.0 ±0.2 ±0.5 15 60 500 ±3.0 120 ±0.03	+2.0 ±0.5 ±1.0 30 100 1,000 ±5.0	% % mV P - P mV P - P μS %		
Output Parameter Conditions Min. Typ. Max. Units Output Voltage Accuracy ±1.0 ±2.0 %	Output Parameter Conditions Dutput Voltage Accuracy VIN = Min to M Line Regulation Iout = 10% to 100 Load Regulation Iout = 10% to 100 Ripple (20 MHz) See Not Noise (20 MHz) See Not Transient Recovery Time, See Note 2 25% Load Step Char Dutput Power Protection Transient Response Deviation Dutput Short Circuit, See Note 3 Continuou	Min. Max D% e 1 e 1 nge 110 us (Autoreco	±1.0 ±0.2 ±0.5 15 60 500 ±3.0 120 ±0.03	+2.0 ±0.5 ±1.0 30 100 1,000 ±5.0	% % mV P - P mV P - P μS %		
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DIN Rail Mount Adapter See Mechanical Diagram (Page 4 Reliability Specifications	Weight	0.77 Oz (22g					
Reliability Specifications	Chassis Mount Adapter						
	DIN Rail Mount Adapter	See Mechanical Diagram (Page					
	Reliability Specifications						
Parameter Conditions Min. Typ. Max. Units	Parameter Conditions	Min.	Тур.	Max.	Units		
MTBF MIL HDBK 217F, 25°C, Gnd Benign 1.0 MHours	MTBF MIL HDBK 217F, 25°C, Gnd Ben	gn 1.0			MHours		
Vibration, 5 - 150 Hz Displacement Range 7.5 mm	Displacement Rar						
Acceleration 2G	Accelerat						
Absolute Maximum Ratings	Absolute Maximum Ratings						
Parameter Conditions Min. Typ. Max. Units	Parameter Conditions	Min.	Тур.	Max.	Units		
	nput Voltage Surge (1 Sec)	-0.7		200.0	VDC		
	Lead Temperature 1.5 mm From Case for 10 S	ec		300	°C		

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DC CONVERTER

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Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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Model Selection Guide

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Madal		Inp	out		Output			Efficience.	Over	Capacitive	Fuse
Model Number	Voltag	je (VDC)	Curren	ıt (mA)	Voltage	Current	Current	Efficiency (%, Typ)	Voltage Protection	Load	Rating Slow-Blow
	Nominal	Range	Full-Load	No-Load	(VDC)	(mA, Max)	(mA, Min)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(VDC Typ)	(µF, Max)	(mA)
MR1011S-05RU	110	40 - 160	112	15	5.0	2,000	100	81	6.2	2,200	250
MR1011S-12RU	110	40 - 160	107	8	12.0	833	42	85	15.0	220	250
MB1011S-15RU	110	40 - 160	107	8	15.0	667	33	85	18.0	100	250
MB1011S-24RU	110	40 - 160	106	8	24.0	416	21	86	28.8	47	250

Notes:

1. When measuring output ripple, it is recommended that an external ceramic capacitor (approx 10 μF) be placed from the +Vour to the -Vour pins.

2. Transient recovery is measured to within a 1% error band for a load step change of 25%.

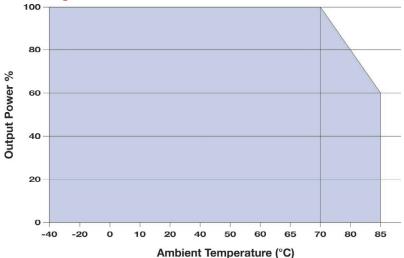
3. Short circuit protection is provided by a "hiccup mode" circuit.

4. These units should not be operated with a load under 5% of full load. Operation at no-load will not damage the unit, but they may not meet all specifications.

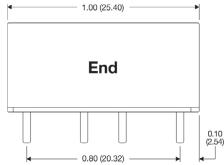
5. These units should not be operated over +85°C. Exceeding +85°C may damage the unit.

 It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

Derating Curve

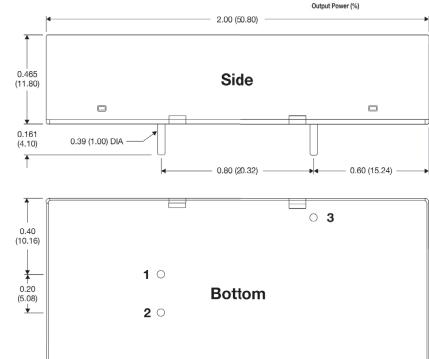


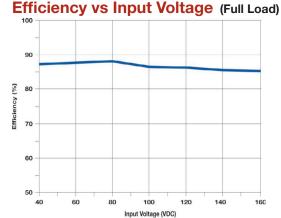
Mechanical Dimensions



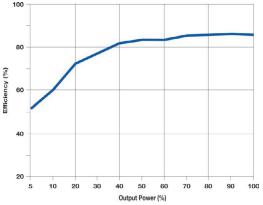
Pin Connections

Pin	Function
1	-VIN
2	+VIN
3	+Vout
4	-Vout





Efficiency vs Output Power (VIN= 110 VDC)



04

EMC Specifications

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Contact the factory for more information.

Contact the factory for more information.

1. With a pulse interval that is >60S. Requires the addition of the filter module MDCFM-40U (or a similar discrete filter circuit) as shown in the circuit/ board layout diagrams below. Contact the factory for more information. 2. With a pulse interval that is >60S. Requires the addition of the filter module MDCFM-40U (or a similar discrete filter circuit) as shown in the circuit/ board layout diagrams below. Contact the factory for more information. 3. All units will meet class B with the addition of the MDCFM-40U (or a similar discrete filter circuit) as shown in the circuit/board layout diagrams below.

4. To meet the requirements of EN 61000-4-4 (±2 kV), external components are needed. This can be done discretely, or with the addition of the MDCFM-40U.

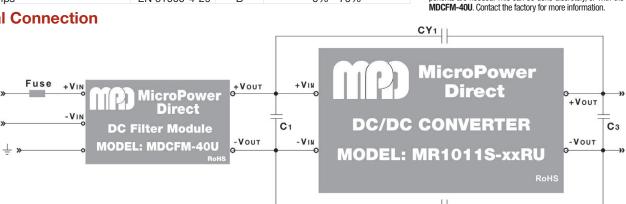
5. To meet the requirements of EN 61000-4-5 (±2 kV/±4 kV), external components are needed. This can be done discretely, or with the addition of the

Notes:

CY₂

Parameter	Standard	Criteria	
Transient Input Voltage, See Note 1	RIA 12	А	385V/20mS Criteria A
Maximum Input Valtaga, Saa Nata 2	EN 50155	В	1,800V (5/50 μ S, 50 OR 100 Ω
Maximum Input Voltage, See Note 2	EN 30133	В	8,400V (0.05/0.1 μS, 100Ω
Radiated Emissions, See Note 3	EN 55022		Class B
Conducted Emissions, See Note 3	EN 55022		Class B
ESD	EN 61000-4-2	В	±6 kV Contact
RS	EN 61000-4-3	А	10V/m
EFT, See Note 4	EN 61000-4-4	В	±2 kV
Surge, See Note 5	EN 61000-4-5	В	±2 kV/ ±4 kV
CS	EN 61000-4-6	А	3 Vrms
Voltage Dips	EN 61000-4-29	В	0% - 70%

Typical Connection



The diagram above illustrates a typical connection of the MR1011S series The 5. Suggested component values are: MDCFM-40U filter module is used to make the circuit compliant with input surge and EMC standards EN 55022, EN61000 and EN 50155. This can also be accomplished by using external filter components as shown in the board layout drawing below. Some notes on these components are:

- 1. It is recommended that an external fuse be used. The recommended fuse is shown in the model chart on page 2.
- 2. An external MOV is recommended on the input to protect the unit in the event of a surge. A recommended value is given in the table at right.
- 3. An external TVS is recommended on the input to protect the unit in the event of a voltage spike. A recommended value is given in the table at right.
- 4. The output filtering capacitor (C3) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above.

Juggesteu	component	values	a.c.
mnonont		Voluo	

Component	Value
MOV	S14K130
L1	56 <i>µ</i> H
TVS	SMCJ170A
C1	100 µF/200V
Сз	1.0 μF/50V
L2	4.7 μH
Cy1, Cy2	1,000 pF/2 kV

Input noise and surge suppression modules are available 6 for a number of MPD DC/DC power supplies. For use with

the MRxx11S product series, the MDCFM-40U DC filter modules are

recommended. For pricing or full technical information, please contact the factory.	Vin (VDC)	Input Capacitor	Vout (VDC)	Output Capacito
In many applications simply			5	470 μF
adding input/output capaci-	110	100.5	12	220 µF

100 µF

15

24

t

tor

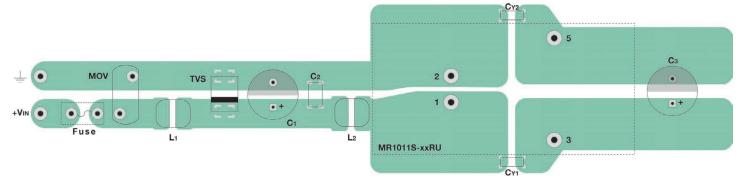
220 JF

100 µF

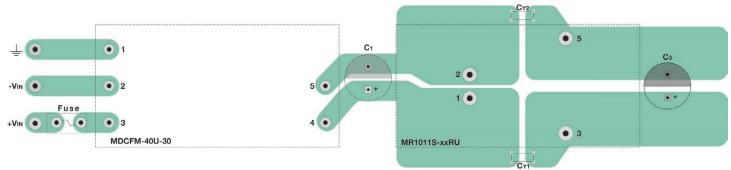
7. In many applications simply	
adding input/output capaci-	
tors will enhance the input	110
surge protection and reduce	
output ripple sufficiently. In	
this case the canacitors C+ and	1 Co wo

ors C1 and C3 would be connected as shown without the other filter components. Recommended capacitor values are given in the table above ...

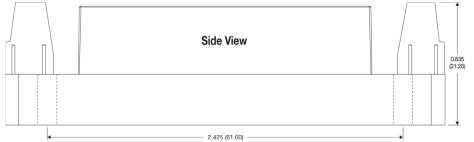
Typical Board Layout: With External Filter/Surge Components

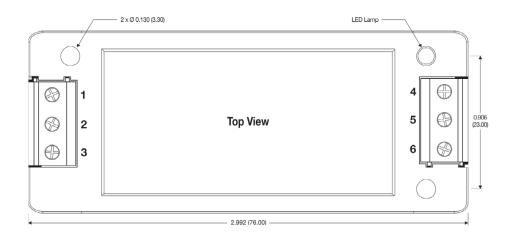


Typical Board Layout: With External Filter Module

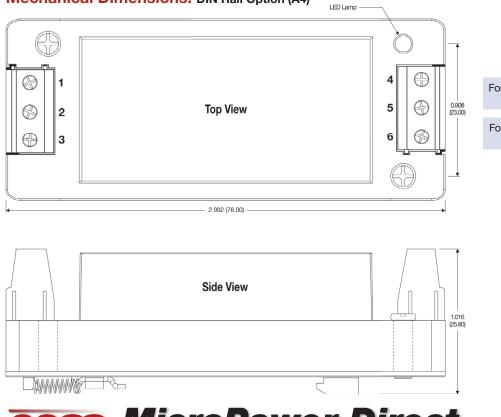


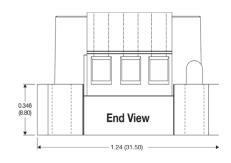
Mechanical Dimensions: Chassis Mount Option (A2)





Mechanical Dimensions: DIN Rail Option (A4)





Adapter Plate



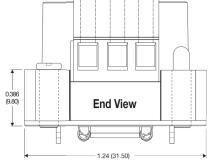
All models of the MR1011S-xxRU series are available mounted on an adapter plate similar to the one pictured above. The adapter plate makes it easier to mount the unit to a chassis or to a standard DIN rail. Please contact the factory for more information.

Pin Connections

Pin	Function
1	No Connection
2	-Vin
3	+VIN
4	-Vout
5	No Connection
6	+Vout

For the chassis mount option, add suffix "A2" to the model number (i.e. MR1011S-05RU-A2)

For the DIN rail mount option, add suffix "A4" to the model number (i.e. MR1011S-24RU-A4)



Notes: • All dimensions are typical in inches (mm) • Tolerance $x.xx = \pm 0.02 \ (\pm 0.50)$

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