

Horizontal Package



Size: 2in x 1in x 0.47in (50.80mm x 25.4mm x 11.80mm)

Horizontal Package with Heatsink ("H" Suffix)



Size: 2.024in x 1.031in x 0.65in (51.4mm x 26.20mm x 16.50mm)

Chassis Mount ("C" Suffix)



Size: 2.99in x 1.24in x 0.84in (76mm x 31.5mm x 21.20mm)

Chassis Mount with Heatsink ("CH" Suffix)



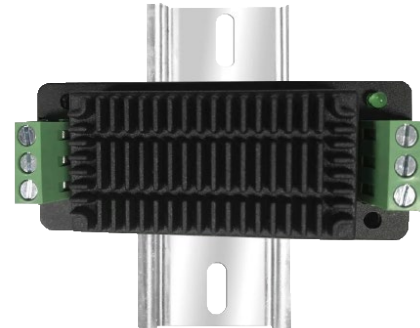
Size: 2.99in x 1.24in x 0.996in (76mm x 31.5mm x 25.3mm)

DIN Rail ("D" Suffix)



Size: 2.99in x 1.24in x 1.016in (76mm x 31.5mm x 25.80mm)

DIN Rail with Heatsink ("DH Suffix)



Size: 2.99in x 1.24in x 1.18in (76mm x 31.5mm x 29.90mm)

## OPTIONS

- Package Type
  - Horizontal
  - Chassis Mount
  - DIN Rail
- Heatsink

## FEATURES

- 4:1 Ultra-Wide Input Voltage Range
- Isolated and Regulated Dual Outputs
- Enhanced Isolation
- RoHS Compliant
- High Efficiency
- Low Ripple & Noise
- International Standard Pin Out

- Over Voltage, Over Current, & Short Circuit Protection
- Reverse Voltage Protection Available for Chassis and DIN Rail Mount
- Meets EN50155 Railway Requirements
- Meets IEC60950, UL60950<sup>(17)</sup>, and EN60950 Standards
- Meets EN50121-3-2 CISPR32/EN55032 Class A without External Components

## APPLICATIONS

- Railway Vehicle Equipment

## DESCRIPTION

The DCRW20 series of DC/DC converters offers up to 20 watts of output power in a horizontal, chassis mount, or DIN rail mount package. This series consists of isolated and regulated dual outputs with an ultra-wide 4:1 input voltage range. Features of this series include enhanced isolation, high efficiency, low ripple and noise and international standard pin out. This series is also protected against over voltage, over current, and short circuit protection, meets EN50155 railway requirements, is RoHS compliant, and meets IEC60950, UL60950<sup>(17)</sup>, and EN60950 standards. Reverse voltage protection is available for chassis and DIN rail mount models.

**MODEL SELECTION TABLE**

Model Number <sup>(1)</sup>	Input Voltage Range <sup>(2)</sup>	Output Voltage	Output Current		Efficiency <sup>(3)</sup>		Maximum Capacitive Load <sup>(4)</sup>	Max. Ripple & Noise	Output Power
			Min Load	Max Load	Min.	Typ.			
DCRW20-110D12	110VDC (40~160VDC)	±12VDC	0mA	±833mA	83%	85%	680μF	100mVp-p	20 Watts
DCRW20-110D15		±15VDC	0mA	±667mA	84%	86%	470μF		
DCRW20-110D24		±24VDC	0mA	±417mA	84%	86%	220μF		

**SPECIFICATIONS**

All specifications are based on Ta=25°C, Humidity <75%, Nominal Input Voltage, and Rated Output Load unless otherwise noted.  
We reserve the right to change specifications based on technological advances.

SPECIFICATION			TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS								
Input Voltage Range			40	110	160	VDC		
	Absolute Maximum <sup>(5)</sup>				170	VDC		
Input Current	Nominal Input Voltage	No Load		3	8	mA		
		Full Load		212	217			
Reflected Ripple Current	Nominal Input Voltage			25		mA		
Surge Voltage	1 sec. max		-0.7		180	VDC		
Starting Voltage	100% Load				40	VDC		
Shutdown Voltage			28	33		VDC		
Input Filter			Pi Filter					
Hot Plug			Unavailable					
OUTPUT SPECIFICATIONS								
Output Voltage			See Table					
Voltage Accuracy	0%-100% Load	Positive Output		±1	±2	%		
		Negative Output		±1	±3			
Line Regulation	Full Load, Input Voltage from Low Voltage to High Voltage	Positive Output		±0.2	±0.5	%		
		Negative Output		±0.5	±1			
Load Regulation <sup>(6)</sup>	5%-100% Load	Positive Output		±0.5	±1			
		Negative Output		±0.5	±1.5	%		
Output Power			See Table					
Output Current			See Table					
Cross Regulation	Dual output, main output 50% load, supplement output from 10%-100% load				±5	%		
Maximum Capacitive Load	Tested at input voltage range and full load		See Table					
Ripple & Noise <sup>(7)</sup>	20MHz bandwidth, 5%-100% Load			50	100	mVp-p		
Transient Recovery Time	25% Load Step Change, Nominal Input Voltage			300	500	μs		
Transient Response Deviation	25% Load Step Change, Nominal Input Voltage			±3	±5	%		
Temperature Coefficient	Full Load			±0.02	±0.03	%/°C		
Starting Time	Nominal Input Voltage & Constant Resistance Load			10		ms		
CTRL <sup>(8)</sup>								
Module Switch On			Ctrl suspended or connected to TTL high level (3.5-12VDC)					
Module Switch Off			Ctrl pin connected to GND or low level (0-1.2VDC)					
Input Current When Switched Off				2	7	mA		
PROTECTION								
Short Circuit Protection	Input Voltage Range		Continuous, Self-Recovery					
Over Current Protection	Input Voltage Range		120		210	%Io		
Over Voltage Protection	Input Voltage Range		110		160			
ENVIRONMENTAL SPECIFICATIONS								
Operating Temperature			-40		+85	°C		
Storage Temperature			-55		+125	°C		
Storage Humidity	Non-Condensing		5		95	%RH		
Pin Welding Resistance Temp.	Welding spot is 1.5mm away from the casing, 10 seconds				300	°C		
Vibration			IEC 61373 Car body 1 B mold					
MTBF	MIL-HDBK-217F @25°C		1000			kHours		
GENERAL SPECIFICATIONS								
Efficiency			See Table					
Switching Frequency <sup>(9)</sup>	PWM Mode			300		KHz		
Isolation Voltage	Test time of 1 minute and leak current lower than 1mA	Input-Output	3000			VDC		
		Input/Output-Casing	1500					
	Test Time of 1 minute and leak current lower than 5mA	Input-Output	1500			VAC		
Insulation Resistance	Input-Output, Isolation voltage 500VDC		1000			MΩ		
Isolation Capacitance	Input-Output, 100KHz/0.1V			2200		pF		

## SPECIFICATIONS

All specifications are based on Ta=25°C, Humidity <75%, Nominal Input Voltage, and Rated Output Load unless otherwise noted.  
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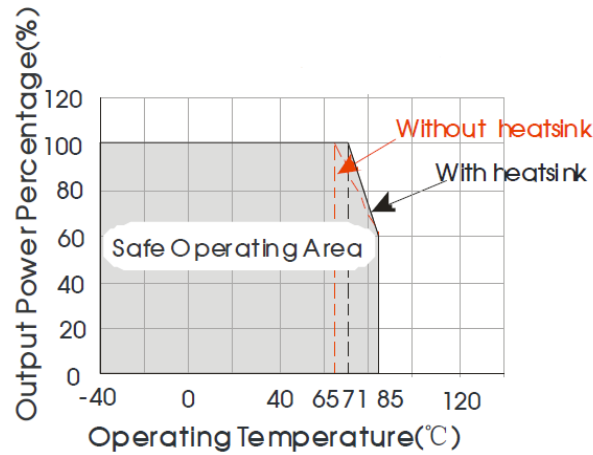
SPECIFICATION				TEST CONDITIONS		Min	Typ	Max	Unit	
PHYSICAL SPECIFICATIONS										
Weight	Without Heatsink		Horizontal Package			0.92oz (26g) Typ.				
			Chassis Mount			1.69oz (48g) Typ.				
			DIN Rail			2.40oz (68g) Typ.				
	With Heatsink		Horizontal Package			1.20oz (34g) Typ.				
			Chassis Mount			1.98oz (56g) Typ.				
			DIN Rail			2.68oz (76g) Typ.				
Dimensions (L x W x H)	Without Heatsink		Horizontal Package			2in x 1in x 0.47in (50.8mm x 25.4mm x 11.8mm)				
			Chassis Mount			2.99in x 1.24in x 0.84in (76mm x 31.5mm x 21.2mm)				
			DIN Rail			2.99in x 1.24in x 1.02in (76mm x 31.5mm x 25.8mm)				
	With Heatsink		Horizontal Package			2.024in x 1.031in x 0.65in (51.4mm x 26.2mm x 16.5mm)				
			Chassis Mount			2.99in x 1.24in x 0.996in (76mm x 31.5mm x 25.3mm)				
			DIN Rail			2.99in x 1.24in x 1.18in (76mm x 31.5mm x 29.90mm)				
Case Material						Aluminum Alloy				
Cooling Method						Free Air Convection				
SAFETY CHARACTERISTICS										
EMC Specifications (EN60950)	EMI			CE	CISPR32/EN55032	Class A <sup>(10)</sup> /Class B <sup>(11)</sup>				
				RE	CISPR32/EN55032	Class A <sup>(10)</sup> /Class B <sup>(11)</sup>				
	EMS	ESD	IEC/EN61000-4-2		Contact ±6kV/Air ±8kV		Perf. Criteria B			
		RS	IEC/EN61000-4-3		20V/m		Perf. Criteria A			
		EFT	IEC/EN61000-4-4		±4kV <sup>(13)</sup>		Perf. Criteria B			
		Surge	IEC/EN61000-4-5		Line to Line ±2KV (2Ω 18uF <sup>(12)</sup> ) Line to Ground ±4kV (12Ω 9uF <sup>(12)</sup> )		Perf. Criteria B			
	CS	IEC/EN61000-4-6		10Vr.m.s		Perf. Criteria A				
EMC Specifications (EN50155)	EMI			CE	EN50121-3-2 EN55016-2-1	150kHz-500kHz 99dBuV <sup>(11)</sup> 500kHz-30MHz 93dBuV				
				RE	EN50121-3-2 EN55016-2-1	30MHz-230MHz 40dBuV/m at 10m <sup>(11)</sup> 230MHz-1GHz 47dBuV/m at 10m				
	EMS	ESD	EN50121-3-2		Contact ±6kV/Air ±8kV		Perf. Criteria B			
		RS	EN50121-3-2		20V/m		Perf. Criteria A			
		EFT	EN50121-3-2		±2kV 5/50ns 5kHz <sup>(13)</sup>		Perf. Criteria A			
		Surge	EN50121-3-2		Line to Line ±1kV (42Ω 0.5uF <sup>(14)</sup> )		Perf. Criteria B			
		CS	EN50121-3-2		0.15MHz-80MHz 10Vr.m.s		Perf. Criteria A			

## NOTES

- Several options are available for this series. Horizontal package is the standard. To indicate a chassis mount option, add "C" to end of model number. To indicate DIN rail mount option, add "D" to end of model number. Heatsink is also available for all models. If application has a higher requirement for heat dissipation, heatsink is recommended. To indicate heatsink, add "H" to end of model number.
- Due to input reverse polarity protection function, minimum value and starting voltage input voltage range for chassis and DIN rail mount models is higher than 1VDC DIP package.
- Efficiency is measured in nominal input voltage and rated output load. Due to input reverse polarity protection for chassis and DIN rail mount models, minimum efficiency greater than Min.-2 is qualified.
- Capacitive loads of positive and negative outputs are the same for dual outputs.
- Converter can handle this absolute maximum rating without damage, but it isn't recommended.
- When testing from 0%-100% load working conditions, load regulation index of ±5%.
- 0%-5% load ripple & noise is no more than 5%Vo. Ripple and noise are measured by "parallel cable" method.
- The voltage of Ctrl pin is relative to input pin GND.
- This series of products uses reduced frequency technology, the switching frequency is test value of full load. When the load is reduced to below 50%, the switching frequency decreases with decreasing load.
- Without External Components
- See Fig. 4 for recommended circuit
- See Fig. 2 for recommended circuit
- See Fig. 2 or Fig. 3 for recommended circuit
- See Fig. 3 for recommended circuit
- Customization available, please contact factory.
- Products classified according to ISO14001 and related environmental laws and regulations and should be handled by qualified units.
- This product is Listed to applicable standards and requirements by UL.

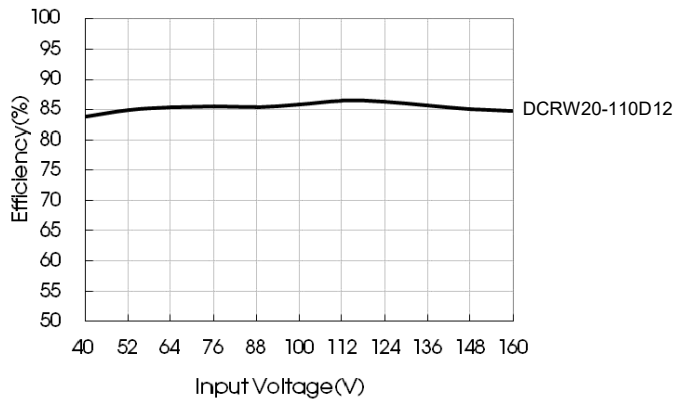
\*Due to advances in technology, specifications subject to change without notice.

## DERATING CURVES

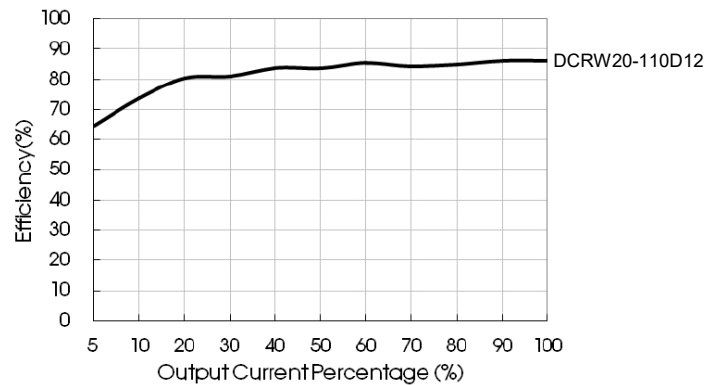


## EFFICIENCY GRAPHS

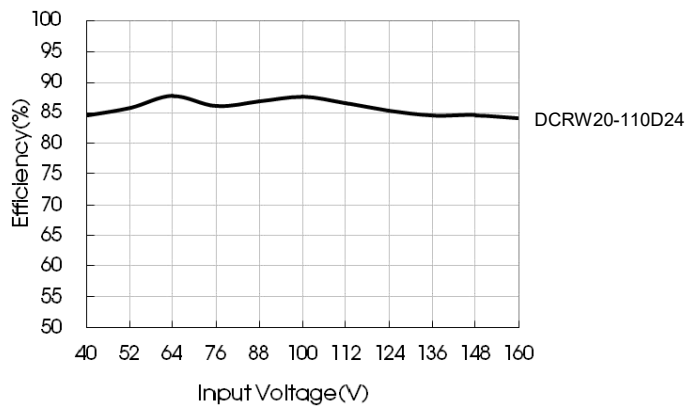
Efficiency vs. Input Voltage (Full Load)



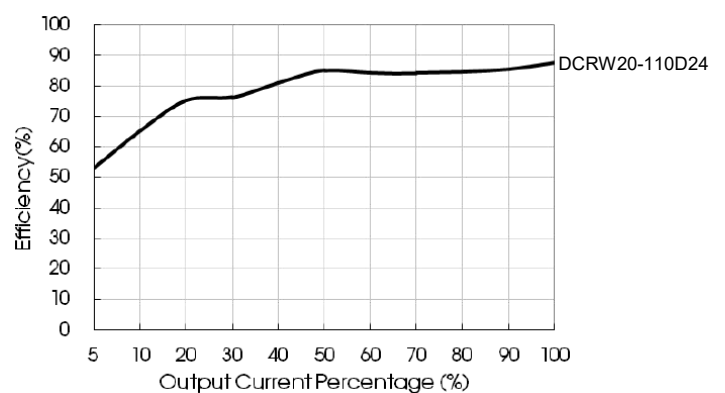
Efficiency vs. Output Load (Vin=48V)



Efficiency vs. Input Voltage (Full Load)

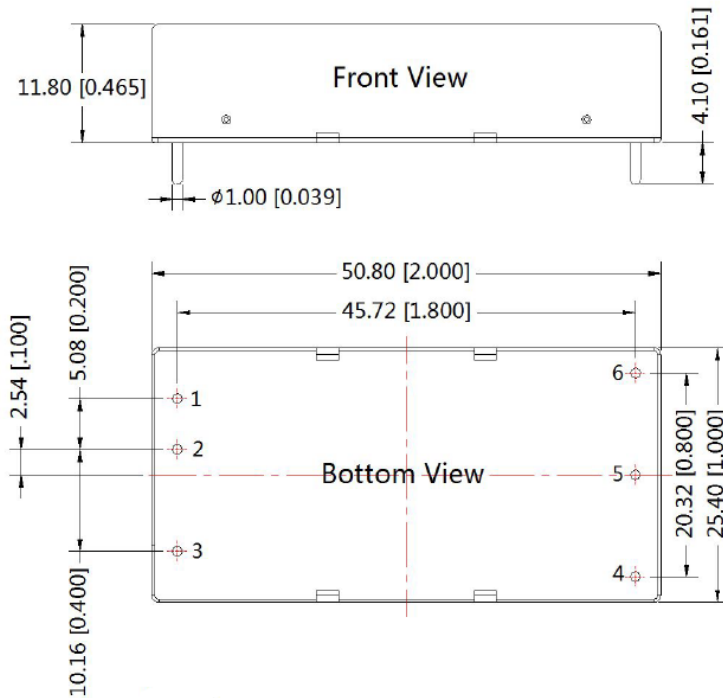


Efficiency vs. Output Load (Vin=48V)

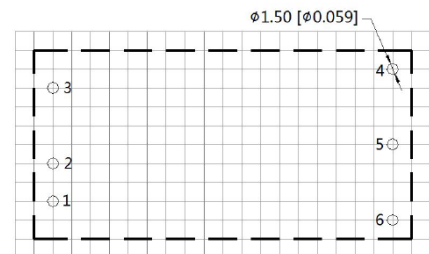


MECHANICAL DRAWINGS

Horizontal Package



THIRD ANGLE PROJECTION

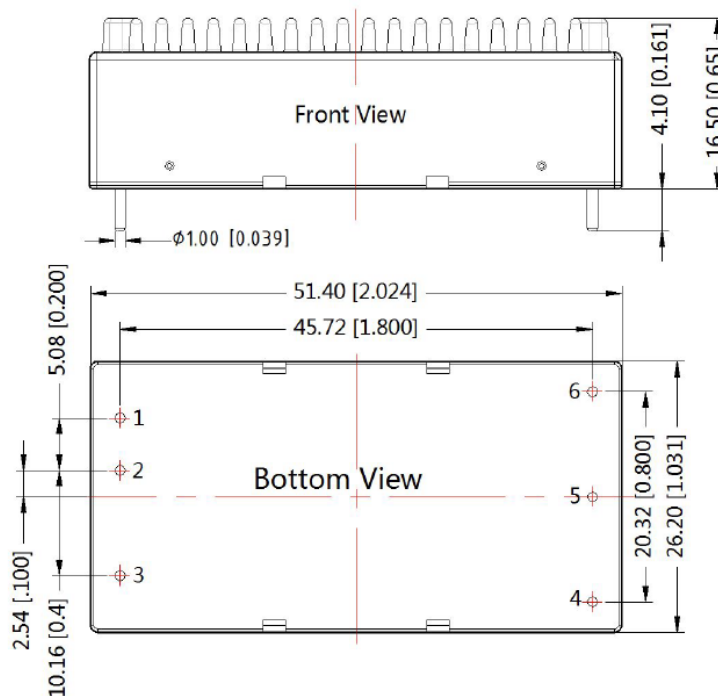


Note: Grid 2.54\*2.54mm  
Pin-Out

Pin	Dual
1	Vin
2	GND
3	Ctrl
4	-Vo
5	0V
6	+Vo

Note:  
Unit: mm [inch]  
Pin Diameter Tolerances:  $\pm 0.10$  [0.004]  
General Tolerances:  $\pm 0.50$  [ $\pm 0.020$ ]

Horizontal Package with Heatsink ("H" Suffix)



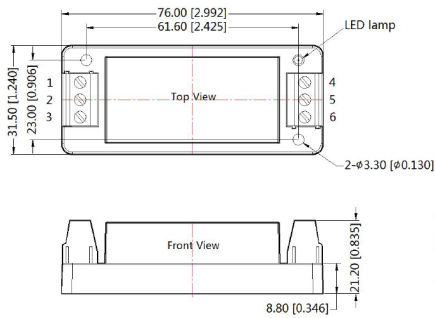
THIRD ANGLE PROJECTION

Pin-Out

Pin	Dual
1	Vin
2	GND
3	Ctrl
4	-Vo
5	0V
6	+Vo

Note:  
Unit: mm[inch]  
General Tolerances:  $\pm 0.50$  [ $\pm 0.020$ ]

### Chassis Mount ("C" Suffix)

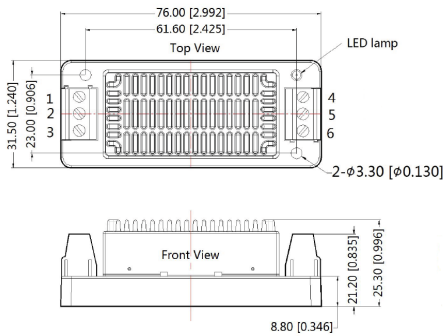


THIRD ANGLE PROJECTION

#### Pin-Out

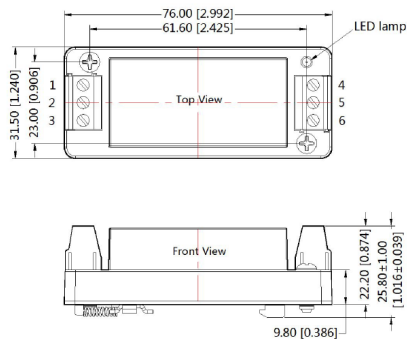
Pin	Dual
1	Ctrl
2	GND
3	Vin
4	-Vo
5	0V
6	+Vo

### Chassis Mount with Heatsink ("CH" Suffix)



Note:  
Unit: mm [inch]  
Wire Range: 24-12AWG  
Tightening Torque: Max 0.4 N·m  
General Tolerances:  $\pm 0.50$  [ $\pm 0.020$ ]

### DIN Rail Mount ("D" Suffix)

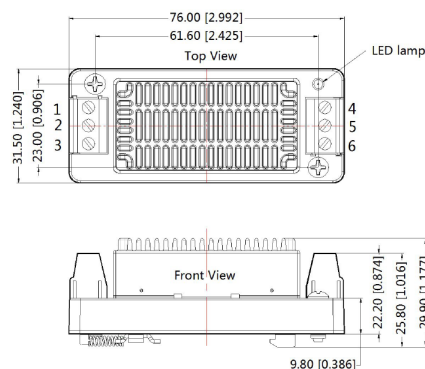


THIRD ANGLE PROJECTION

#### Pin-Out

Pin	Dual
1	Ctrl
2	GND
3	Vin
4	-Vo
5	0V
6	+Vo

### DIN Rail Mount with Heatsink ("DH" Suffix)



Note:  
Unit: mm [inch]  
Wire range: 24-12AWG  
Mounting Rail (For Heatsink): TS35  
Tightening Torque: Max 0.4 N·m  
General Tolerances: Standard:  $\pm 0.50$  [ $\pm 0.020$ ]  
Heatsink:  $\pm 1.00$  [ $\pm 0.039$ ]



## DESIGN REFERENCE

### 1. Typical Application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 1) before delivery. If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors  $C_{in}$  and  $C_{out}$  or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.



Fig. 1

Vout (VDC)	Fuse	Cin	Cout
$\pm 12/\pm 15$	2A, slow blow	10 $\mu$ F-47 $\mu$ F	220 $\mu$ F
$\pm 24$			100 $\mu$ F

### 2. EMC module solution-recommended circuit

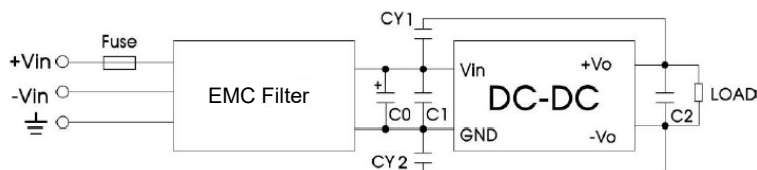


Fig. 2

Fig. 2 Parameter Description

Output Voltage	±12V	±15V	±24V
FUSE	Choose according to actual input current.		
EMC Filter	Contact factory for filter suggestion. Input voltage range: 40V-160V		
C0	100μF/200V		
C1	47μF/200V		
C2	220μF/25V	100μF/35V	
CY1, CY2	1000pF/400VAC		

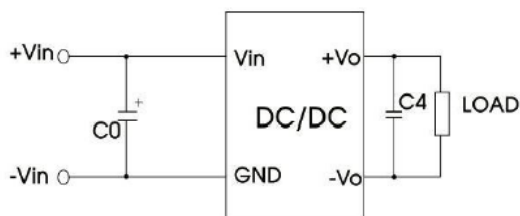


Fig. 3

Fig. 3/4 Parameter Description

Output Voltage	$\pm 12V$	$\pm 15V$	$\pm 24V$
C0	100 $\mu$ F/200V		
C1, C2	0.22 $\mu$ F/250V		
C3	47 $\mu$ F/200V		
LCM1, LCM2	30mH (common mode inductance)		
CY1, CY2	1000pF/400VAC		
CY3, CY4	2200pF/400VAC		
C4	220 $\mu$ F/25V	100 $\mu$ F/35V	

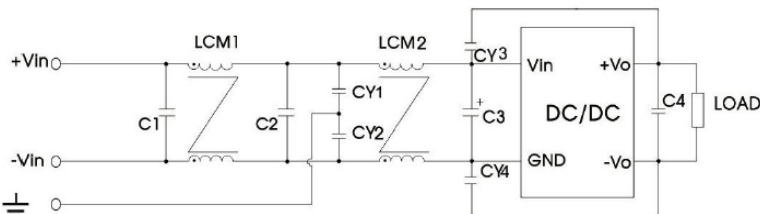


Fig. 4

### 3. Modules cannot be connected in parallel to increase power.

## MODEL NUMBER SETUP

DCRW	20	-	110	D	12	C	H
Series Name	Output Power		Input Voltage	Output Quantity	Output Voltage	Package Type	Heatsink
			110: 40-160VDC	D: Dual	12: $\pm 12$ VDC 15: $\pm 15$ VDC 24: $\pm 24$ VDC	Blank: Through Hole C: Chassis Mount D: DIN Rail	Blank: None H: Heatsink

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**COMPANY INFORMATION**

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

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