

MI600ERW Series



Miniature 1" x 1" 6W, Single & Dual Output DC/DC Converters

Key Features:

- 6W Output Power
- 2:1 Input Voltage Range
- Miniature 1" x 1" Case
- 1,500 VDC Isolation
- Meets CISPR 32/EN 55032
- Single & Dual Outputs
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Chassis & DIN Rail Mount



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Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	12 VDC Input	9.0	12.0	18.0	VDC
	24 VDC Input	18.0	24.0	36.0	
	48 VDC Input	36.0	48.0	75.0	
Input Start Voltage	12 VDC Input			9.0	VDC
	24 VDC Input			18.0	
	48 VDC Input			36.0	
Input Under Voltage Protection	12 VDC Input	5.5	6.5		VDC
	24 VDC Input	12.0	15.5		
	48 VDC Input	26.0	30.0		
Reflected Ripple Current			20		mA
Input Filter	Pi (π) Filter				
Output Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	I _{OUT} = 5% to 100%		±1.0	±3.0	%
	±5 V _{OUT} Model All Other Models		±2.0 ±1.0	±5.0 ±3.0	
Output Voltage Balance	Dual Outputs, Balanced Loads		±0.5	±1.5	%
Line Regulation	V _{IN} = Min to Max	Positive Output	±0.2	±0.5	%
		Negative Output	±0.5	±1.0	%
Load Regulation	I _{OUT} = 5% to 100%	Positive Output	±0.5	±1.0	%
		Negative Output	±0.5	±1.5	%
Cross Regulation	See Note 2			±5.0	%
Ripple & Noise (20 MHz)	See Note 3		60	85	mV P - P
Transient Recovery Time			300	500	μSec
Transient Response Deviation	See Note 4	3.3 & 5 V _{OUT} Models	±5.0	±8.0	%
		All Other Models	±3.0	±5.0	
Temperature Coefficient				±0.03	%/°C
Output Over Voltage Protection		110		160	%V _{OUT}
Output Over Current Protection		110	140	190	%I _{OUT}
Output Short Circuit	Continuous (Autorecovery)				
General Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	Input/Output 100 KHz/0.1V		1,000		pF
Switching Frequency			300		kHz
Environmental Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%
Physical					
Case Size, Module, Chassis /DIN Rail Mount	See Mechanical Drawings (Starting Page 4)				
Case Material	Aluminum (UL94-V0)				
Weight, Module, Chassis /DIN Rail Mount	See Mechanical Drawings (Starting Page 4)				
Reliability Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Safety Standards, See Note 5	UL/cUL 60950-1 recognition (UL certificate)				
Vibration	10-55 Hz, 10G, 7.5 mm, 30 Min along X, Y & Z Axis				
Absolute Maximum Ratings					
Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	12 VDC Input			25.0	VDC
	24 VDC Input			50.0	
	48 VDC Input			100.0	
Lead Temperature	1.5 mm From Case for 10 Sec			300	°C

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

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Model Number	Input				Output			Efficiency (% Typ)	Capacitive Load (µF Max)	Certification	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MI612S-05ERW	12	9.0 - 18.0	617	10	5.0	1,200	0.0	81	1,000	CE	1,200
MI612S-12ERW	12	9.0 - 18.0	588	10	12.0	500	0.0	85	470	CE	1,200
MI612D-05ERW	12	9.0 - 18.0	617	10	±5.0	±600	±0.0	81	470	UL/CE	1,200
MI612D-12ERW	12	9.0 - 18.0	588	10	±12.0	±250	±0.0	85	100	UL/CE	1,200
MI624S-03ERW	24	18.0 - 36.0	270	5	3.3	1,500	0.0	77	1,800	CE	600
MI624S-05ERW	24	18.0 - 36.0	304	5	5.0	1,200	0.0	82	1,000	CE	600
MI624S-09ERW	24	18.0 - 36.0	294	5	9.0	667	0.0	85	470	---	600
MI624S-12ERW	24	18.0 - 36.0	294	5	12.0	500	0.0	85	470	CE	600
MI624S-15ERW	24	18.0 - 36.0	290	5	15.0	400	0.0	86	220	CE	600
MI624S-24ERW	24	18.0 - 36.0	294	5	24.0	250	0.0	85	100	CE	600
MI624D-05ERW	24	18.0 - 36.0	301	5	±5.0	±600	±0.0	83	470	UL/CE	600
MI624D-12ERW	24	18.0 - 36.0	287	5	±12.0	±250	±0.0	87	100	UL/CE	600
MI624D-15ERW	24	18.0 - 36.0	287	5	±15.0	±200	±0.0	87	100	UL/CE	600
MI648S-03ERW	48	36.0 - 75.0	131	4	3.3	1,500	0.0	79	1,800	---	300
MI648S-05ERW	48	36.0 - 75.0	150	4	5.0	1,200	0.0	83	1,000	---	300
MI648S-12ERW	48	36.0 - 75.0	143	4	12.0	500	0.0	87	470	---	300
MI648S-15ERW	48	36.0 - 75.0	142	4	15.0	400	0.0	88	220	---	300
MI648S-24ERW	48	36.0 - 75.0	142	4	24.0	250	0.0	88	100	---	300

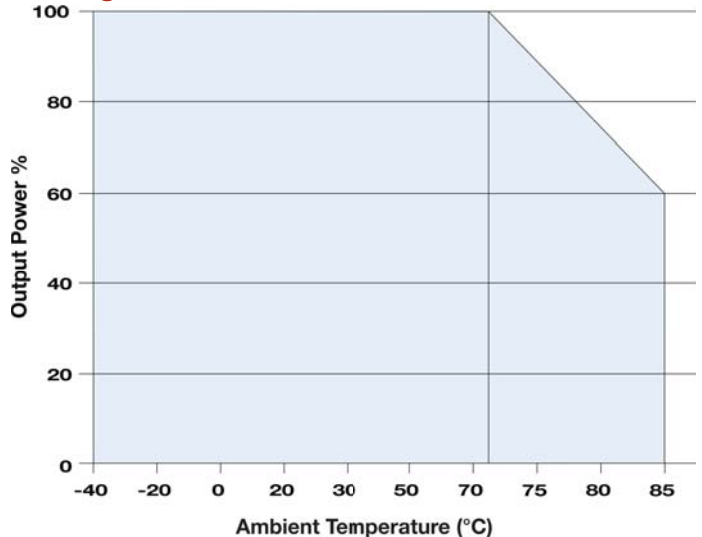
For the A2S adapter board option, add suffix "A2S" to the model no. (i.e. **MI624D-05ERW-A2S**)

For the A4S adapter board option, add suffix "A4S" to the model no. (i.e. **MI648S-24ERW-A4S**)

Notes:

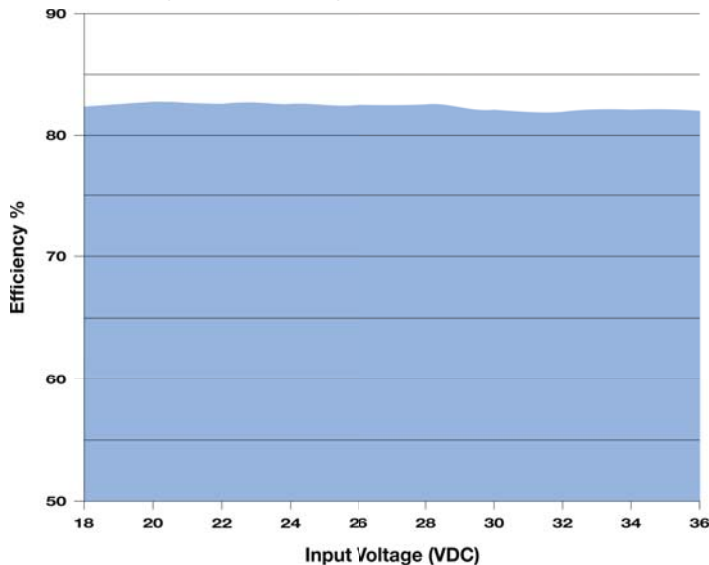
1. The specified maximum capacitive load is for each output.
2. Cross regulation is measured on dual output models with one output at 50% load while the other output is varied from 10% load to 100% load.
3. When measuring output ripple & noise, it is recommended that an external 10 µF capacitor be placed from the +Vout to the -Vout pins for single output units and from each output to common for dual output models. From 0% - 5% output load, ripple & noise is 5% max.
4. Transient recovery is measured to within a 1% error band for a load step change of 25%.
5. See the Model Selection Guide above to see which models have been certified by external testing agencies.
6. Dual output units may be connected to provide a 10V, 24V, or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
7. Operation at no-load will not damage these units. However, they may not meet all specifications.
8. 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

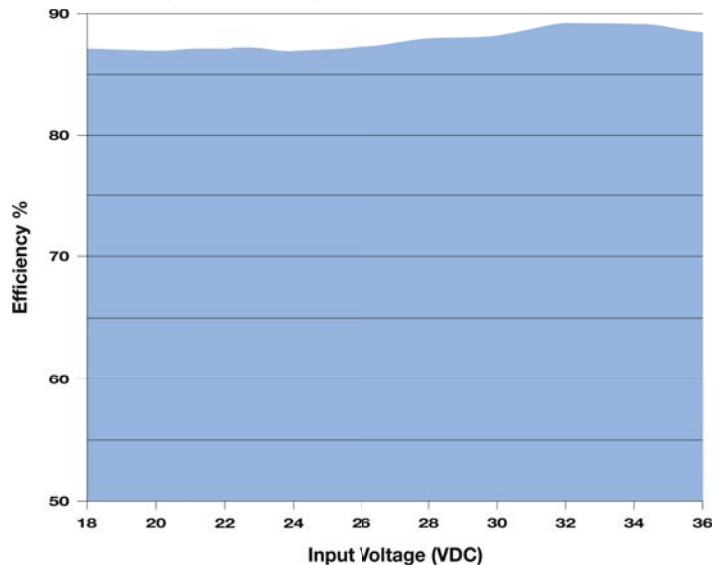


Efficiency Curves: Efficiency vs Input Voltage

MI624D-15ERW (24 VIN - ±15 Vout)

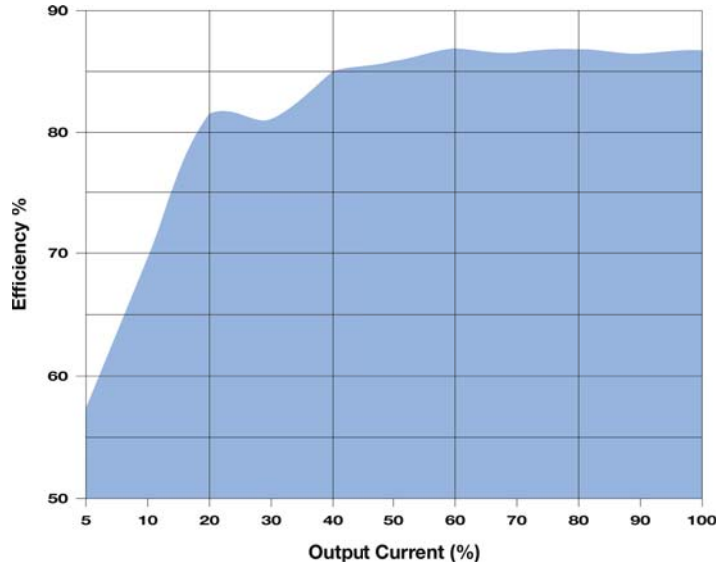


MI624S-05ERW (24 VIN - 5 Vout)

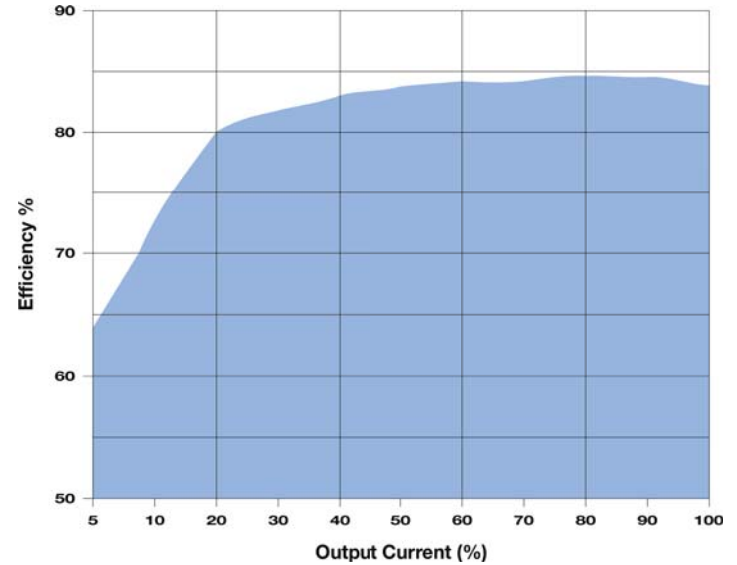


Efficiency Curves: Efficiency vs Output Voltage

MI624D-15ERW (24 VIN - ±15 Vout)



MI624S-05ERW (24 VIN - 5 Vout)



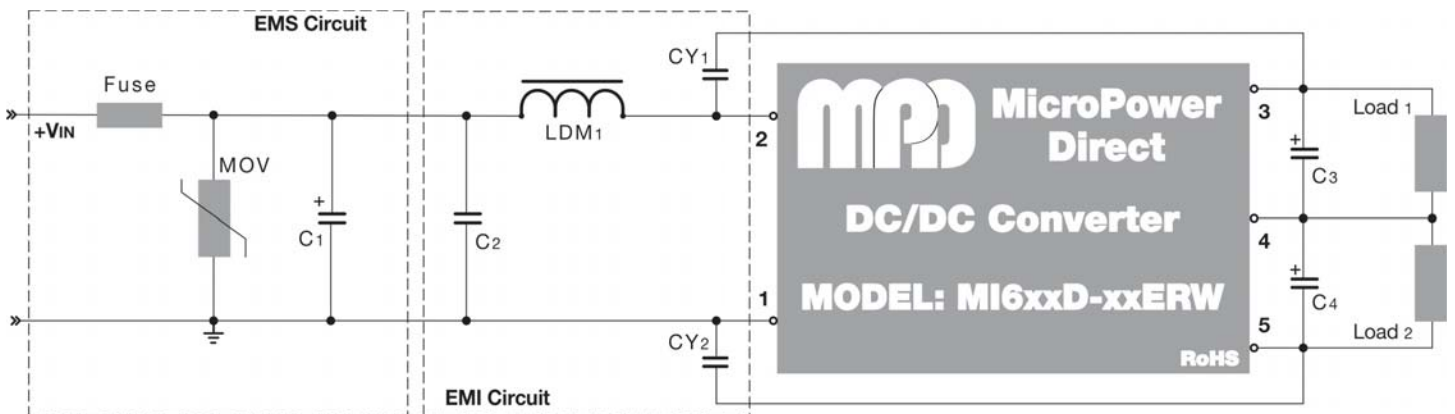
EMI Characteristics

Parameter	Models	Standard	Criteria	Level
Radiated Emissions (See Note 1)	12V & 24V Input	CISPR 32/EN 55032		Class A (without external components)
	48V Input			Class B (See Typical Connection below)
Conducted Emissions (See Note 1)	12V & 24V Input	CISPR 32/EN 55032		Class A (without external components)
	48V Input			Class B (See Typical Connection below)
ESD		EN 61000-4-2	B	±4 kV Contact
RS		EN 61000-4-3	A	10V/m
EFT	See Note 2	EN 61000-4-4	B	±2 kV
Surge	See Note 3	EN 61000-4-5	B	±2 kV
CS		EN 61000-4-6	A	3 Vrms
Voltage Dips		EN 61000-4-29	B	0% - 70%

Notes:

- If the application does not require that emissions meet international standards, simply adding capacitors to the input and output circuits may be sufficient to reduce ripple & noise. See note 5 below.
- To meet the requirements of EN 61000-4-4, external components are needed. The connection diagram below shows an external input filter that would typically achieve this. Contact the factory for more information.
- To meet the requirements of EN 61000-4-5, external components are needed. This can be done as shown in the connection diagram below. Contact the factory for more information.

Typical Connection



For applications that require meeting EMC standards, the diagram above illustrates a typical connection of the MI600xERW series. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

- An external fuse should be used in all power module applications. The recommended fuse is shown in the model chart on page 2.
- To protect against a surge, an external MOV is recommended on the input. A suggested value is given in the table at right.
- All input/output filtering capacitors should have a low equivalent impedance. Any output capacitors used should be high frequency, low resistance electrolytic capacitors. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of all capacitors should be 60% or greater.

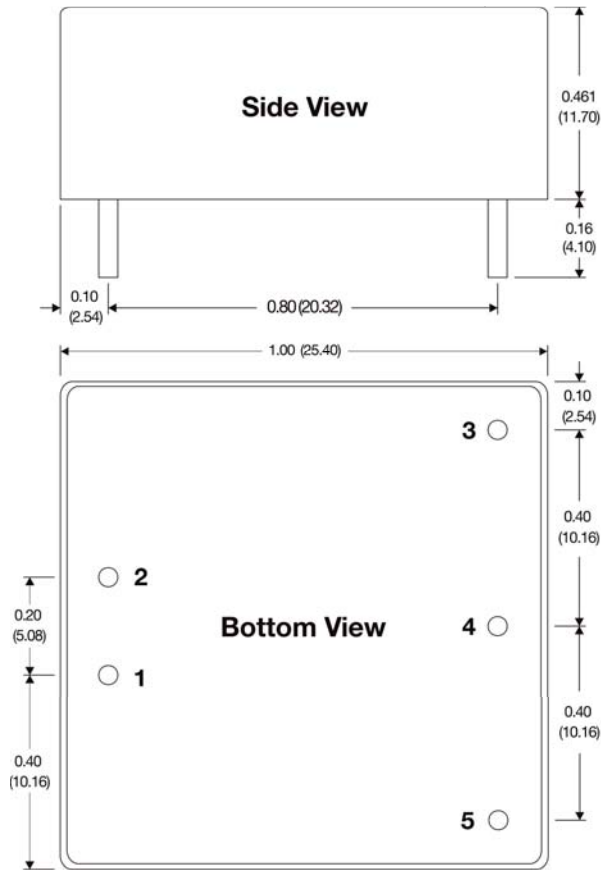
4. Recommended values for components are:

Component	12 VIN	24 VIN	48 VIN
MOV	S14K20	S20K30	14D101K
C1	1,000 μF/35V	1,000 μF/35V	330 μF/100V
C2	1 μF/50V	1 μF/50V	1 μF/100V
LDM1	4.7 μH	4.7 μH	4.7 μH
CY1	1 nF/2 kV	1 nF/2 kV	1 nF/2 kV
CY2	1 nF/2 kV	1 nF/2 kV	1 nF/2 kV
C3	10 μF	10 μF	10 μF
C4	10 μF	10 μF	10 μF

5. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. Suggested capacitor values are:

Input Voltage	12 VIN	24 VIN	48 VIN
CIN	100 μF	10 - 47 μF	100 μF
COU	10 μF	10 μF	10 μF

Mechanical Dimensions



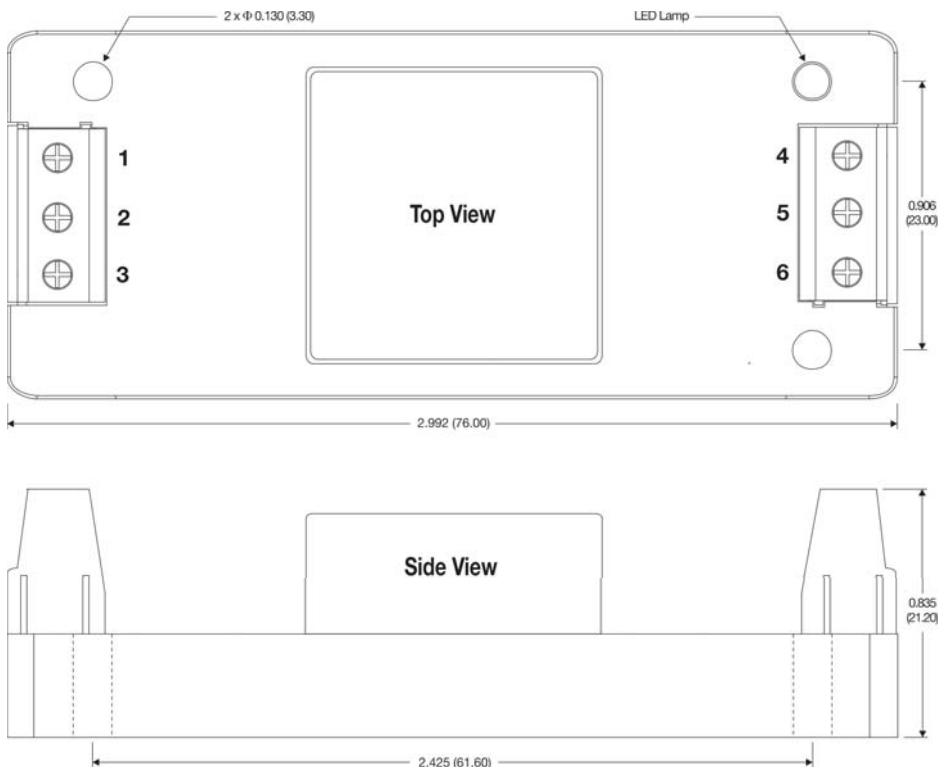
Pin Connections

Pin	Single Output	Pin	Dual Output
1	-VIN	1	-VIN
2	+VIN	2	+VIN
3	+VOUT	3	+VOUT
4	No Pin	4	Common
5	-VOUT	5	-VOUT

Notes:

- All dimensions are typical in inches (mm)
- Pin Section Tolerance x.xxx = ± 0.004 (± 0.100)
- General Tolerance x.xx = ± 0.01 (± 0.25)
- Weight: 0.49 Oz (14g)

Mechanical Dimensions, A2S: With Chassis Mount & Power Good LED



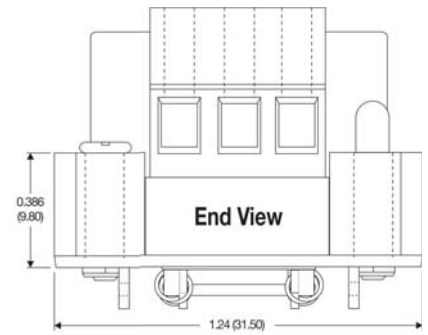
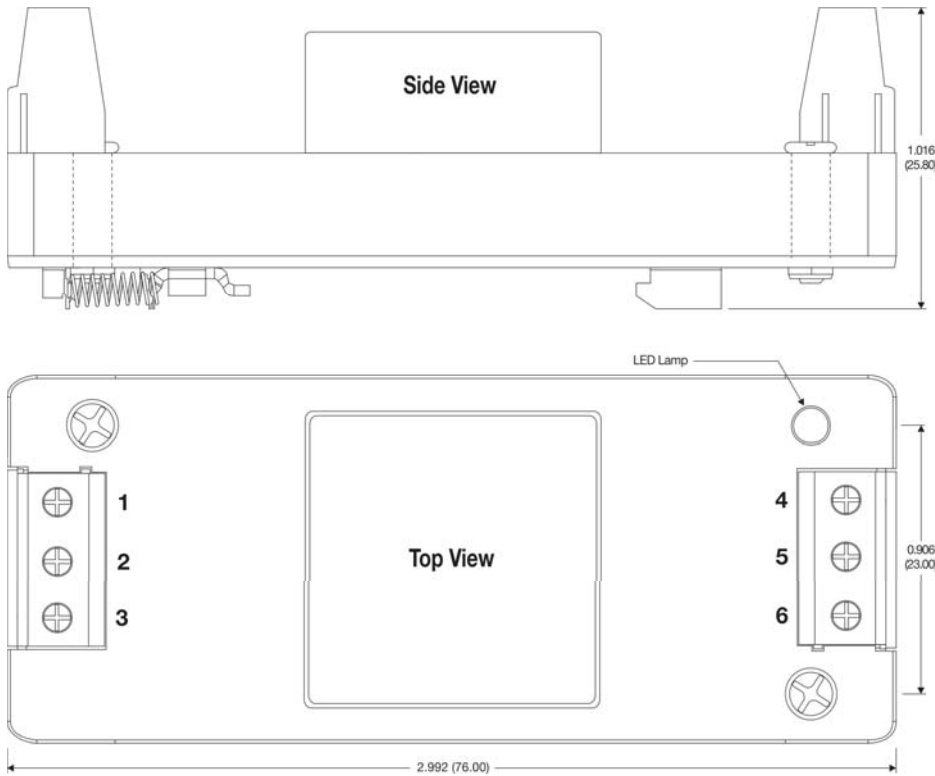
Pin Connections

Pin	Single Output	Pin	Dual Output
1	No Connection	1	No Connection
2	-VIN	2	-VIN
3	+VIN	3	+VIN
4	-VOUT	4	-VOUT
5	No Connection	5	Common
6	+VOUT	6	+VOUT

Notes:

- All dimensions are typical in inches (mm)
- General Dimension Tolerance x.xx = ± 0.02 (± 0.50)
- Wire Range: 12 to 24 AWG
- Tightening Torque: 0.4 Nm Max
- Weight: 1.26 Oz (36g)
- The LED indicates the output voltage is present (LED "On")

Mechanical Dimensions, A4S: With DIN Rail Mount Option & Power Good LED



Pin Connections

Pin	Single Output	Pin	Dual Output
1	No Connection	1	No Connection
2	-VIN	2	-VIN
3	+VIN	3	+VIN
4	-Vout	4	-Vout
5	No Connection	5	Common
6	+Vout	6	+Vout

Notes:

- All dimensions are typical in inches (mm)
- General Dimension Tolerance x.xx = ±0.02 (±0.50)
- Wire Range: 12 to 24 AWG
- Tightening Torque: 0.4 Nm Max
- Weight: 6.66 Oz (190g)
- For use with a TS35 type DIN rail
- The LED indicates the output voltage is present (LED "On")

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