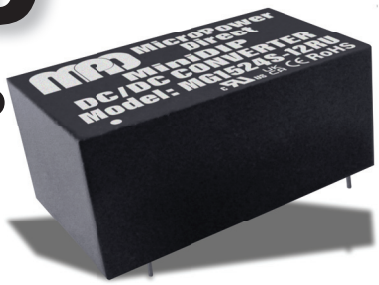
MG1500RU

Compact 15W MiniDIP Ultra Wide 4:1 Input DC/DC Converters



Key Features:

- 15W Output Power
- Compact MiniDIP Case
- EN 62368 Approved
- Ultra-Wide 4:1 Input Range
- High Efficiency
- 1,500 VDC Isolation
- Single and Dual Outputs
- Under Voltage Protection
- Overload Protection
- -40°C to +85°C Operation
- ***LOW COST***

MicroPower Direct
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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	24 VDC Input	9.0	24.0	36.0	VDC
	48 VDC Input	18.0	48.0	75.0	
Input Start-up Threshold	24 VDC Input			9.0	VDC
	48 VDC Input			18.0	
Under Voltage Shutdown	24 VDC Input		8.0		VDC
	48 VDC Input		16.0		
Start Up Time	See Note 1		30		mS
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy				±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads		±1.0	±2.0	%
Line Regulation	VIN = Min To Max		±0.2	±0.8	%
Load Regulation	IOUT = 0% To 100%			±1.0	%
Cross Regulation	Asymetrical Load (25%/100%)			±5.0	%
Ripple & Noise (20 MHz)	See Note 2		70		mV P - P
Transient Recovery Time	See Note 3			500	µSec
Transient Response Deviation			±3.0	±5.0	%
Overload Protection	See Note 4	110	160		%
Temperature Coefficient			±0.01	±0.02	%/°C
Output Short Circuit	See Note 5		Continuous (Autorecovery)		

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
	1 Second	1,800			
	Input/Output to Case	1,000			
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 1V			2,200	pF
Switching Frequency			480		kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient, 5.1VOUT Models	-40	+25	+50	°C
	5.1VOUT Models With Heatsink	-40		+65	
	Ambient, All Other Models	-40		+55	
	All Other Models With Heatsink	-40		+70	
Case Temperature				+110	°C
Storage Temperature Range		-50		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size and Weight	See Mechanical Diagram (Pages 6 & 7)
Case Material	Metal with Nonconductive Baseplate

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	2.026			MHours
Safety Standards	UL/cUL 62368-1 recognition (UL certificate)				

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input			50.0	VDC
	48 VDC Input			100.0	
Lead Temperature	1.5 mm From Case For 10 Sec			260	°C

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

Model Selection Guide

Model Number	Input				Output			Output Capacitive Load (µF Max)	Efficiency (%, Typ)	Fuse Rating Slow-Blow (A)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MG1524S-051RU	24	9.0 - 36.0	726	10	5.1	2,940	0.0	1,800	86	4.0
MG1524S-12RU	24	9.0 - 36.0	718	10	12.0	1,250	0.0	820	87	4.0
MG1524S-15RU	24	9.0 - 36.0	718	10	15.0	1,000	0.0	820	87	4.0
MG1524S-24RU	24	9.0 - 36.0	718	10	24.0	625	0.0	270	87	4.0
MG1524D-12RU	24	9.0 - 36.0	718	10	±12.0	±625	0.0	560	87	4.0
MG1524D-15RU	24	9.0 - 36.0	718	10	±15.0	±500	0.0	270	87	4.0
MG1548S-051RU	48	18.0 - 75.0	363	7.0	5.1	2,940	0.0	1,800	86	2.0
MG1548S-12RU	48	18.0 - 75.0	359	7.0	12.0	1,250	0.0	820	87	2.0
MG1548S-15RU	48	18.0 - 75.0	359	7.0	15.0	1,000	0.0	820	87	2.0
MG1548S-24RU	48	18.0 - 75.0	359	7.0	24.0	625	0.0	270	87	2.0
MG1548D-12RU	48	18.0 - 75.0	359	7.0	±12.0	±625	0.0	560	87	2.0
MG1548D-15RU	48	18.0 - 75.0	359	7.0	±15.0	±500	0.0	270	87	2.0

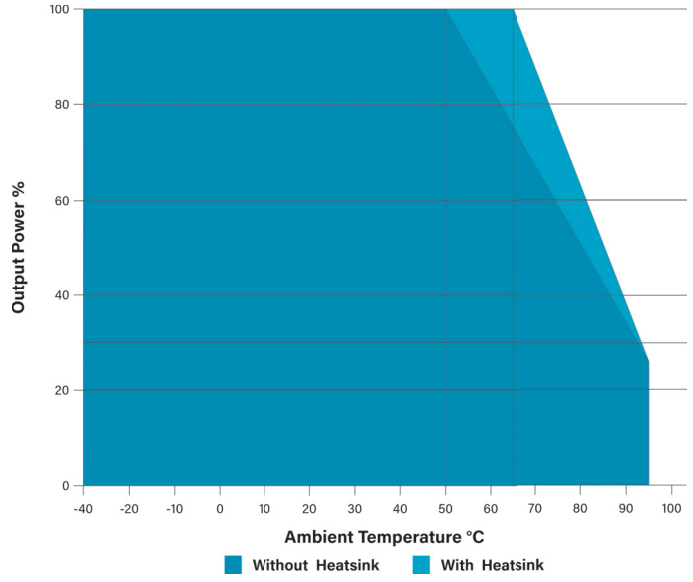
Notes:

1. Tested at nominal VIN with a constant resistive load.
2. When measuring output ripple, it is recommended that an external 2.2 µF ceramic capacitor be placed in parallel from the +VOUT pin to the -VOUT pin for single output models, or from each output to common for dual output models.
3. Transient recovery is measured to within a 1% error band for a load step change of 25%.
4. Output overload protection is provided by a Hiccup circuit with auto-recovery.
5. Output short circuit protection is provided by a Hiccup circuit with auto-recovery. Hiccup mode is 0.3 Hz typical.
6. Operation at no load will not damage these units, however, they may not meet all specifications.
7. 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.
8. The specified maximum capacitive load is for each output.

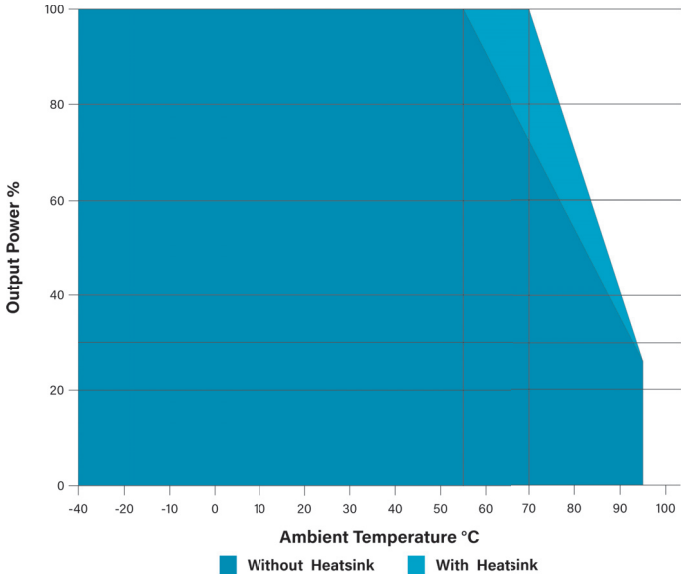
This series is also available with a 2:1 input voltage range. The **MG1500RW** series offers similar high performance features and miniature packaging.

These product families are part of a very wide variety of DC/DC converter products available from **MPD**. Our DC/DC units range from 1W to 50W and are available in industry standard packages. All at very low cost.

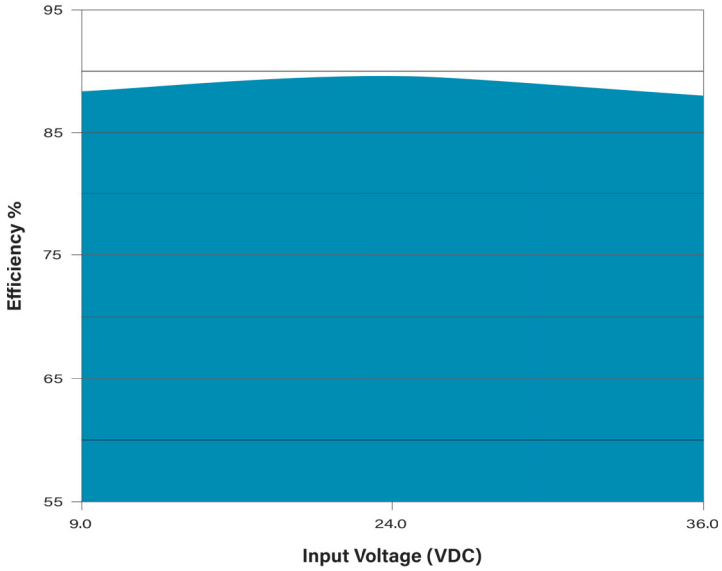
Temperature Derating: MG1524S-051RU, MG1548S-051RU



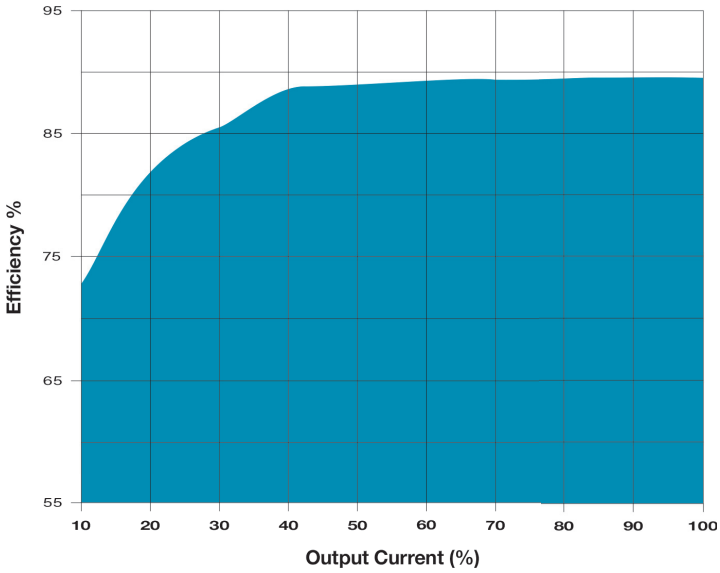
Temperature Derating: All Other Models



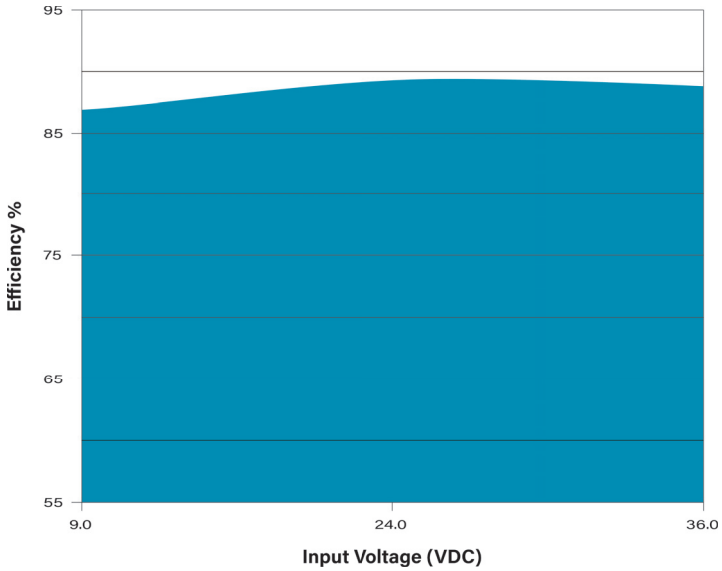
Efficiency vs Input: MG1524S-051RU



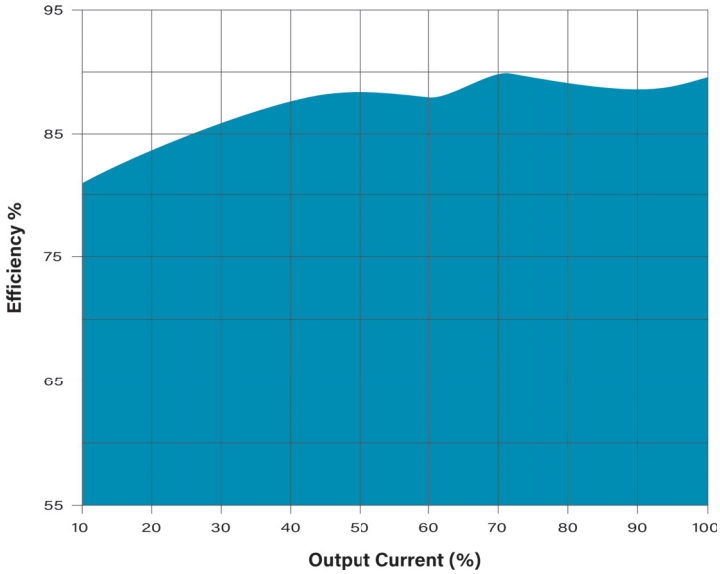
Efficiency vs Output Load: MG1524S-051RU



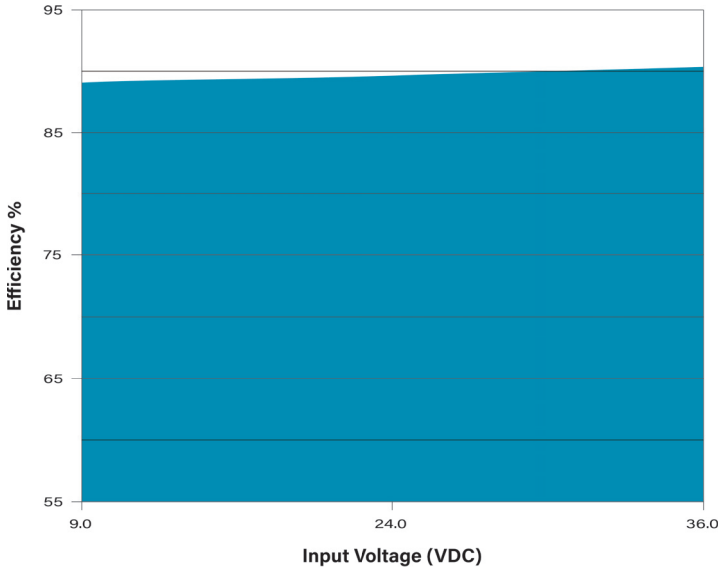
Efficiency vs Input: MG1524S-12RU



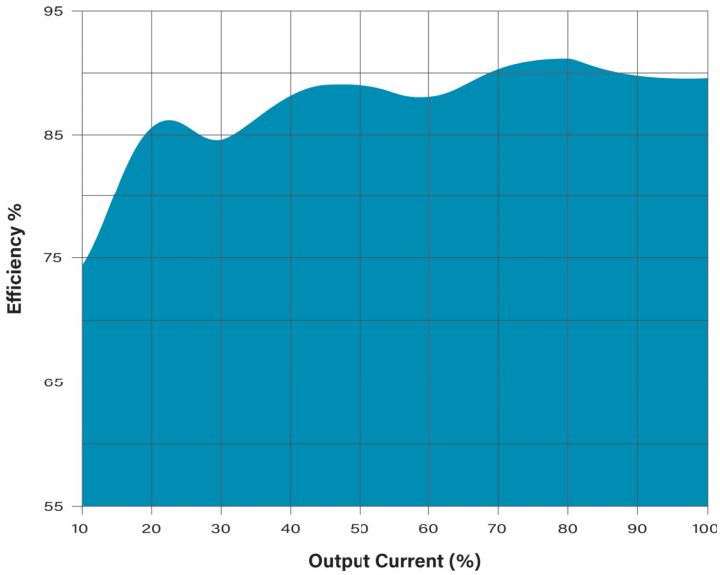
Efficiency vs Output Load: MG1524S-12RU



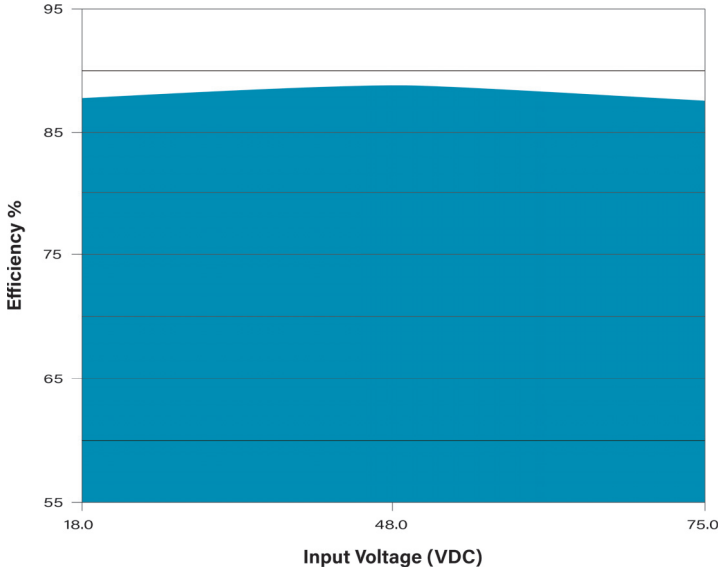
Efficiency vs Input: MG1524S-24RU



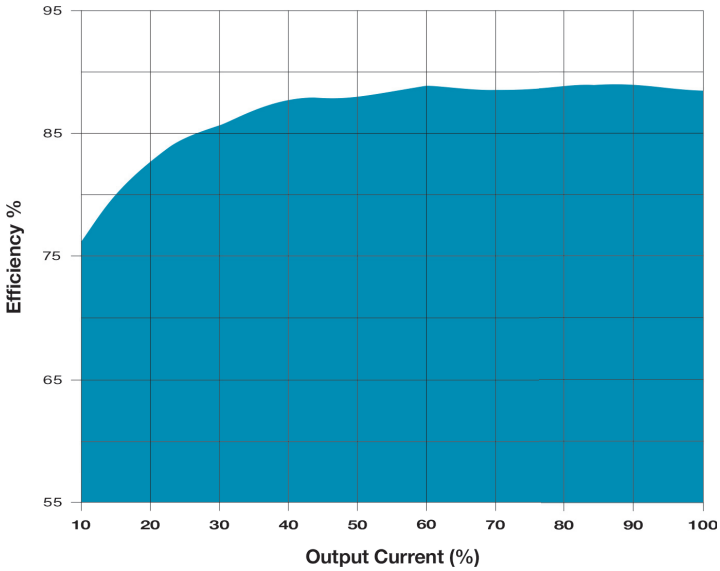
Efficiency vs Output Load: MG1524S-24RU



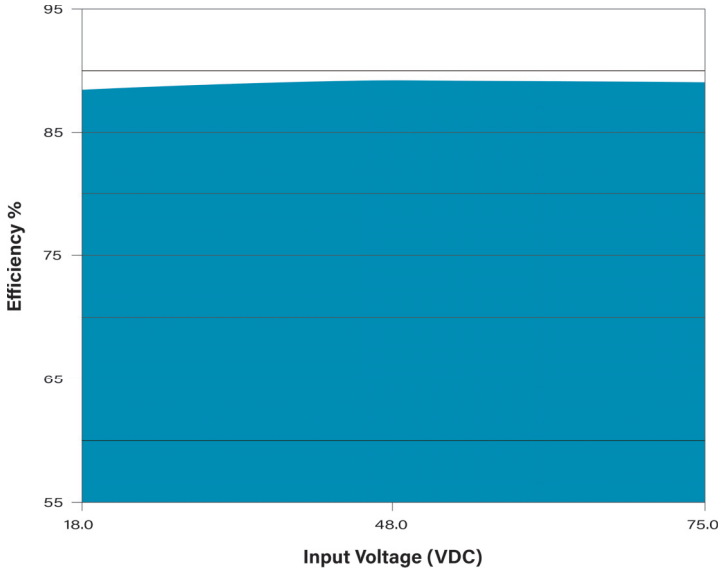
Efficiency vs Input: MG1548S-051RU



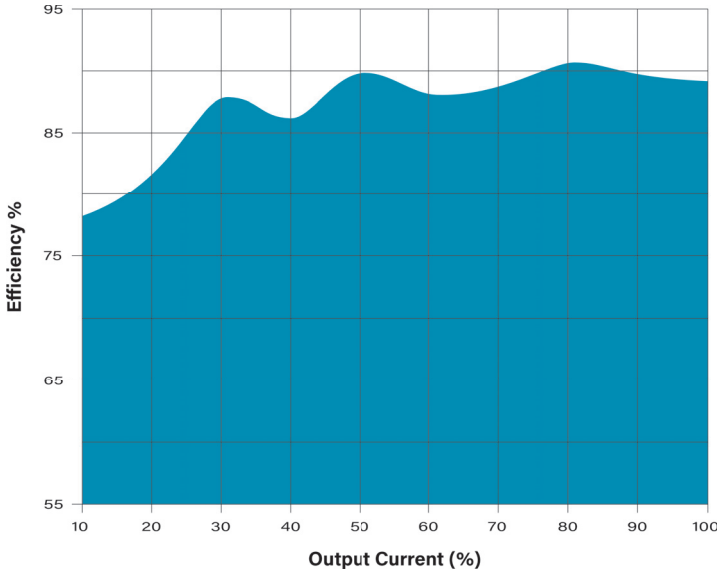
Efficiency vs Output Load: MG1548S-051RU



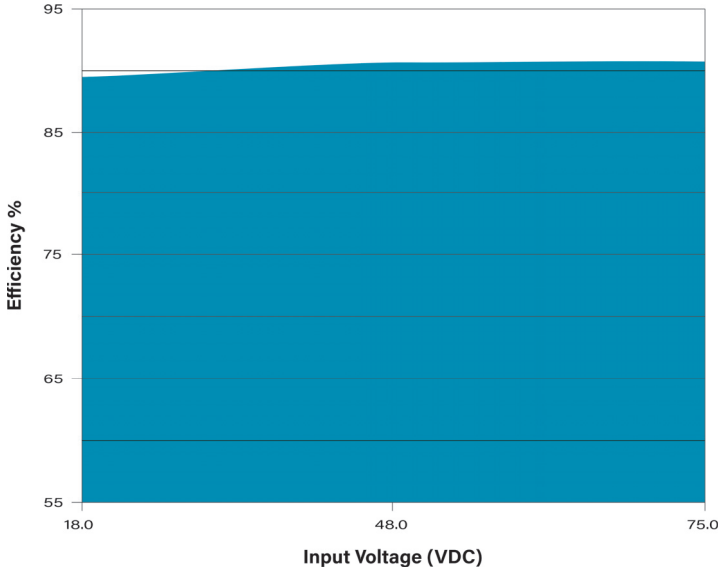
Efficiency vs Input: MG1548S-12RU



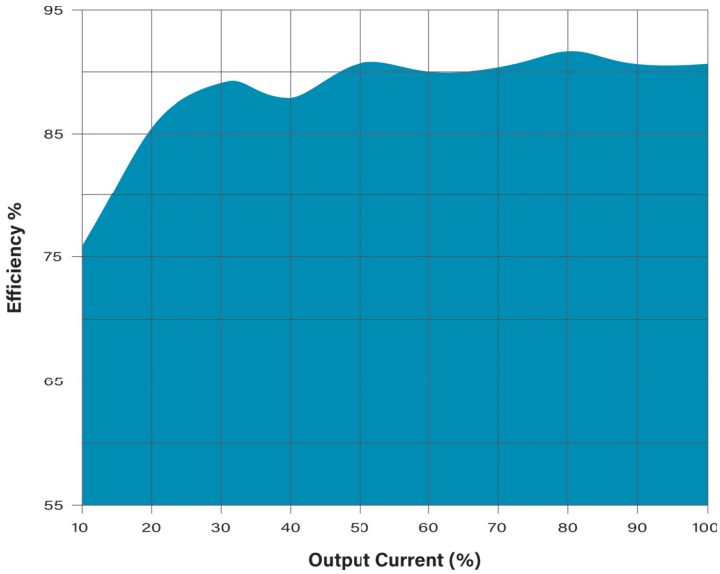
Efficiency vs Output Load: MG1548S-12RU



Efficiency vs Input: MG1548S-24RU



Efficiency vs Output Load: MG1548S-24RU



Typical Connection: Single Output

The diagram at left illustrates a typical connection of the **MG1500DRU**. For applications that do not require the circuit to meet EMI/EMC specifications, the capacitors C1 and C2/C3 will reduce input/output ripple and improve the converter stability over time and temperature. The recommended component values are given in the table below.

Model	C1	C2/C3
MG1524SRU	2.2 µF/50V	2.2 µF/50V
MG1548SRU	27 µF/200V/KXJ	2.2 µF/50V

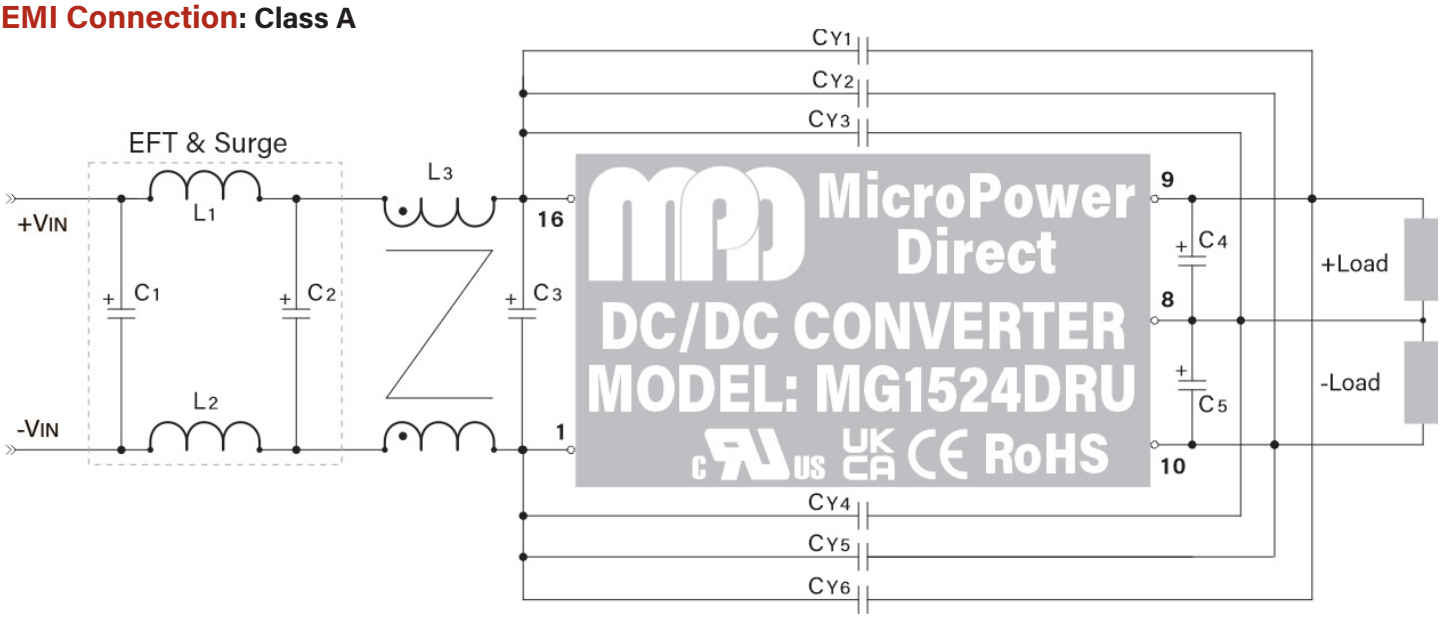
ESR <1.0Ω at 100 kHz

EMI/EMC Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	EN 55032		Class A
Conducted Emissions	EN 55032		Class A
ESD	EN 61000-4-2	A	±6 kV Contact
			±8kV Air
RS	EN 61000-4-3	A	20V/m
EFT, See note at left	EN 61000-4-4	A	±2 kV
Surge, See note at left	EN 61000-4-5	A	±2 kV
CS	EN 61000-4-6	A	10 Vrms
PFMF	EN 61000-4-8	A	30A/m (1s)

These converters will meet the requirements of EN 55032, Class A conducted emissions without external components. To meet EN 55032 Class A or B radiated emissions, external components are required. Suggested connection diagrams for Class A and Class B circuits are given starting below and continuing on the next two pages. Contact the factory for more information.

EMI Connection: Class A

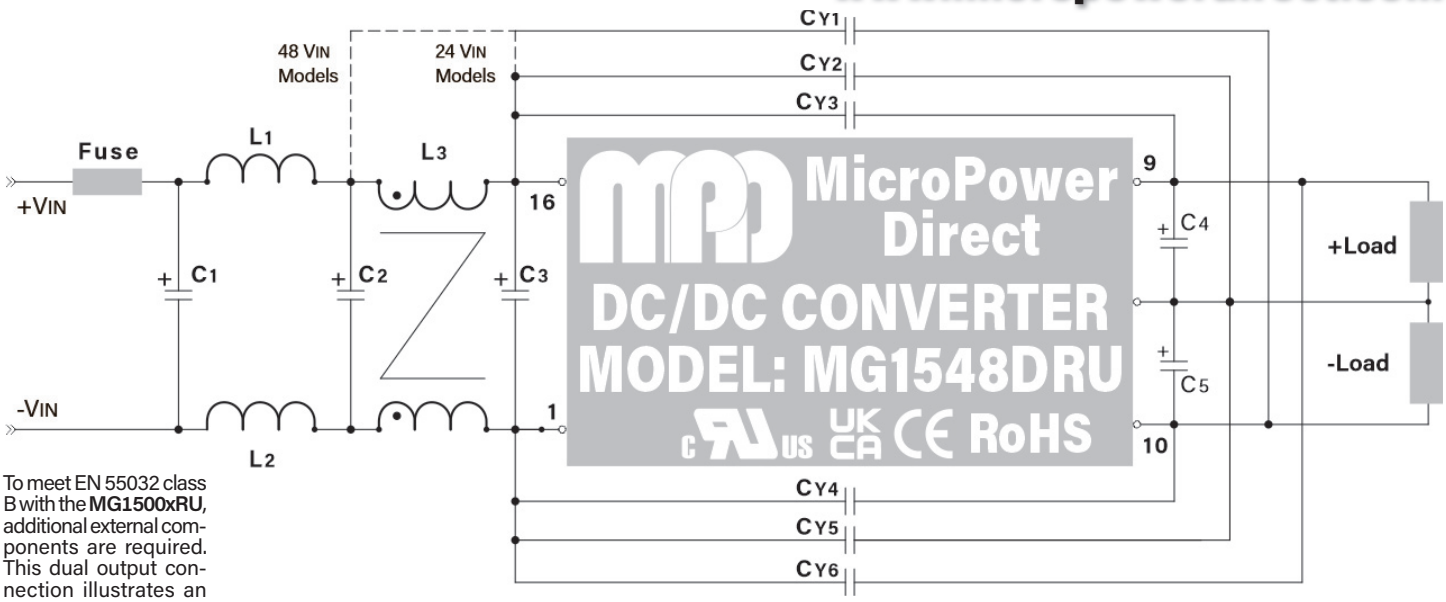


To meet the requirements of EN 55032 class A with the **MG1500xRU**, additional external components are required. The single output connection shown above illustrates an external circuit that will typically meet these requirements.

The external input components C1, C2 and L1/L2 are required to meet EN 61000-4-4 (EFT) and EN61000-4-5 (Surge).

Model	C1/C2	L1/L2	L3	C3	CY1	CY2	CY3	CY4	CY5	CY6	C4/C5
MG1524S-xxRU	470 µF/50V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	---	2.2 µF/50V	---	1000 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	---	---	---	2.2 µF/50V
MG1524D-12RU	470 µF/50V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	---	2.2 µF/50V	---	---	1000 pF/2 kV 1808 X7R	---	---	1000 pF/2 kV 1808 X7R	2.2 µF/50V
MG1524D-15RU	470 µF/50V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	---	2.2 µF/50V	---	1000 pF/2 kV 1808 X7R	---	---	---	1000 pF/2 kV 1808 X7R	2.2 µF/50V
MG1548S-xxRU	220 µF/100V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744273222	27 µF/200V	1000 pF/2 kV 1808 X7R	680 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	680 pF/2 kV 1808 X7R	---	---	2.2 µF/50V
MG1548D-12RU MG1548D-15RU	220 µF/100V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744273222	27 µF/200V	1500 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	1800 pF/2 kV 1808 X7R	1800 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	2.2 µF/50V

EMI Connection: Class B



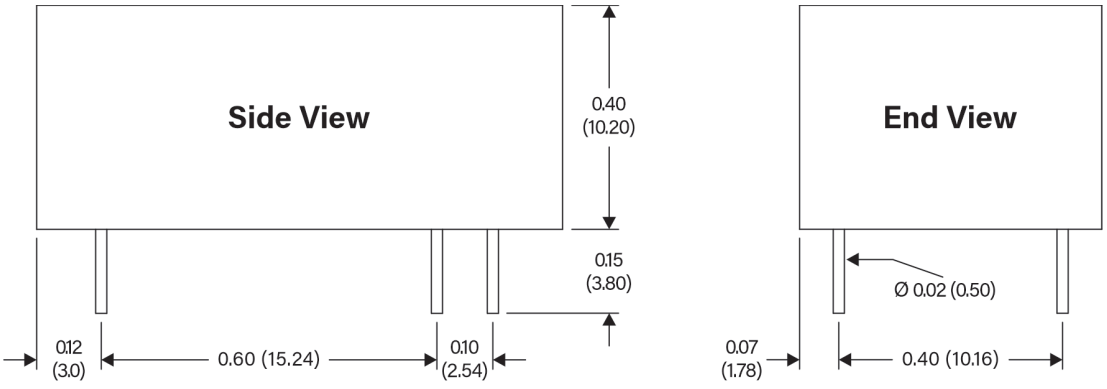
To meet EN 55032 class B with the **MG1500xRU**, additional external components are required. This dual output connection illustrates an external circuit that will typically meet these requirements.

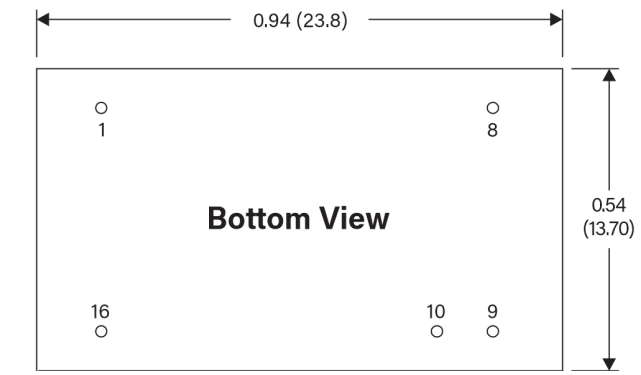
The external input components C1, C2 and L1 / L2 are required to meet EN 61000-4-4 (EFT) and EN61000-4-5 (Surge).

For the 48 VIN, 12, 15 & 24 VOUT (single) models, a filter similar to L3 is required on the output (L4). Contact the factory for more information.

Model	C1/C2	L1/L2	L3	C3	CY1	CY2	CY3	CY4	CY5	CY6	C4/C5	L4
MG1524S-xxRU	470 µF/50V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744841414	2.2 µF/50V	1200 pF/2 kV 1808 X7R	330 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	680 pF/2 kV 1808 X7R	---	---	2.2 µF/50V	---
MG1524D-12RU **MG1524D-15RU**	470 µF/50V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744841414	2.2 µF/50V	1000 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	---	---	2.2 µF/50V	---
MG1548S-051RU	220 µF/100V CHEMI-CON KY Series	15 µH/1.53A 89 mΩ 74477410	810 ACM121110 22PLTL1	27 µF/200V	1000 pF/2 kV 1808 X7R	680 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	---	---	2.2 µF/50V	---
MG1548-12SRU **MG1548-15SRU** **MG1548-24SRU**	220 µF/100V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744273222	27 µF/200V	---	680 pF/2 kV 1808 X7R	680 pF/2 kV 1808 X7R	---	---	---	2.2 µF/50V	744273222
MG1548D-12RU **MG1548D-15RU**	220 µF/100V CHEMI-CON KY Series	10 µH/2.2A 78 mΩ 74477410	744273222	27 µF/200V	680 pF/2 kV 1808 X7R	1000 pF/2 kV 1808 X7R	2200 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	1200 pF/2 kV 1808 X7R	1500 pF/2 kV 1808 X7R	2.2 µF/50V	---

Mechanical Dimensions





Pin Connections

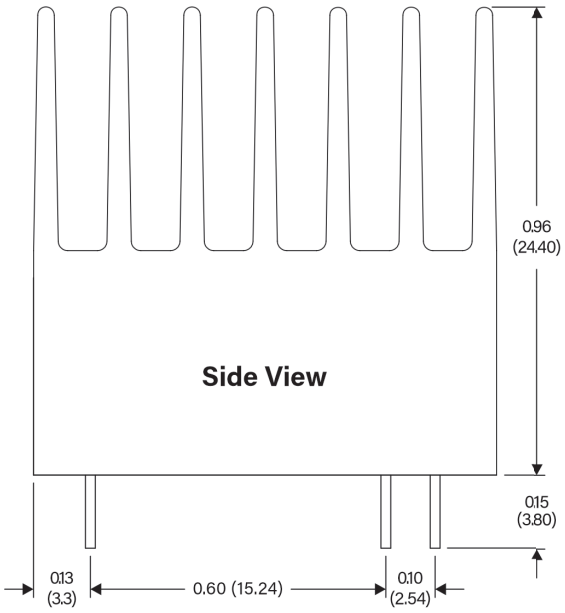
Pin	Single	Dual
1	-VIN	-VIN
8	NC	Common
9	+VOUT	+VOUT
10	-VOUT	-VOUT
16	+VIN	+VIN

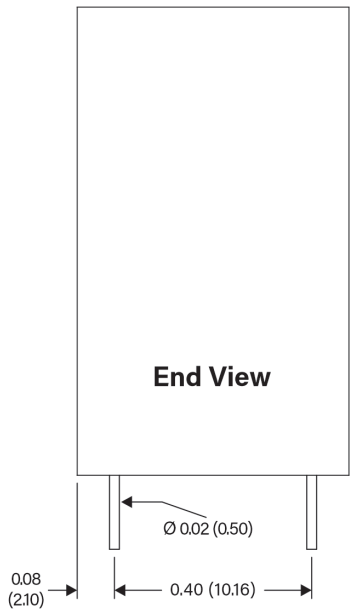
NC = No Connection

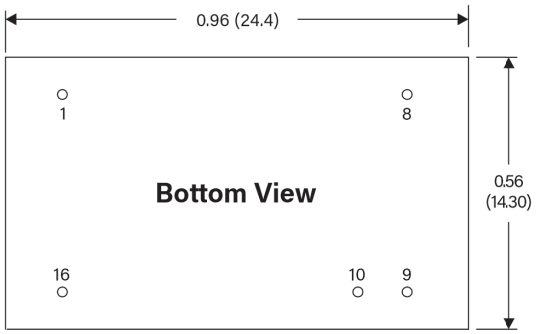
Notes:

- All dimensions are typical in inches (mm)
- Pin 1 is marked by a "dot" or indentation on the unit
- General Tolerance = (X.X) ±0.02 (±0.5)
  (X.XX) ±0.01 (±0.25)
- Pin Tolerance = ±0.002 (±0.05)
- Recommended pin hole size (on the application PC Board) is Ø 0.03 (Ø 0.80)
- Weight (Typ) = **0.306 Oz (8.77g)**

Mechanical Dimensions







Pin Connections

Pin	Single	Dual
1	-VIN	-VIN
8	NC	Common
9	+VOUT	+VOUT
10	-VOUT	-VOUT
16	+VIN	+VIN

NC = No Connection

Notes:

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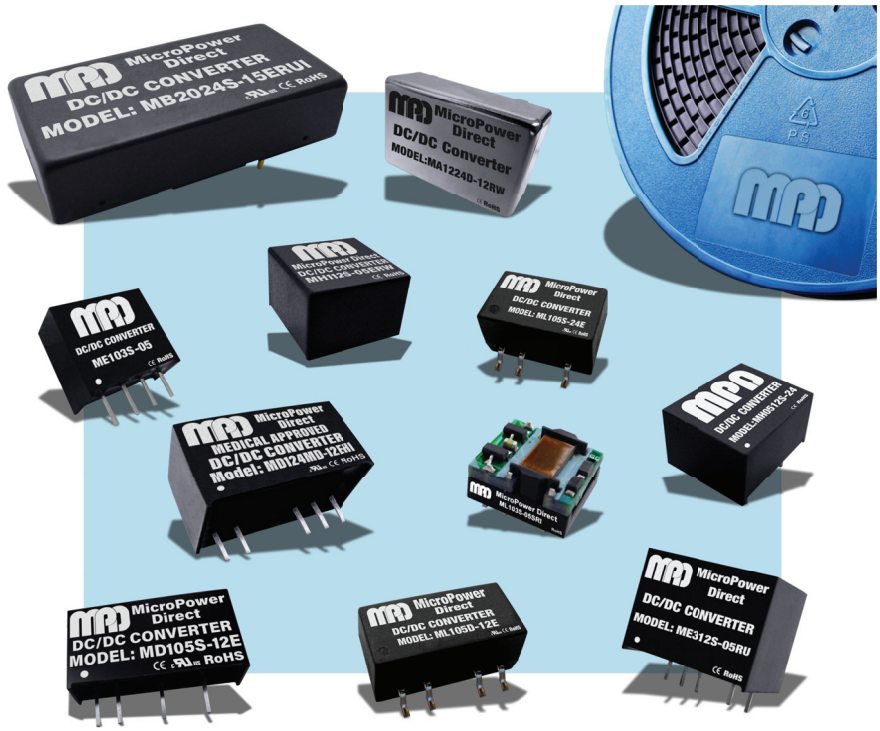
  (X.XX) ±0.01 (±0.25)
- Pin Tolerance = ±0.002 (±0.05)
- Recommended pin hole size (on the application PC Board) is Ø 0.03 (Ø 0.80)
- Weight (Typ) = 0.500 Oz (14.2g)

MPD offers a very wide variety of DC/DC converters. Our standard product line includes SMT, SIP, and DIP potted modules, industry standard 1 x 1" & 1 x 2" modules, as well as new models in an ultra miniature DFN package. Our units are used in applications ranging from high speed gate drive circuits to instrumentation to industrial equipment and medical equipment/instrumentation. Units are available over a power range of 0.25 to 60W. Most models meet international EMC/EMI standards and many are fully approved to EN 62368. Call today, or go to our website to find the right DC/DC power module for your application.



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