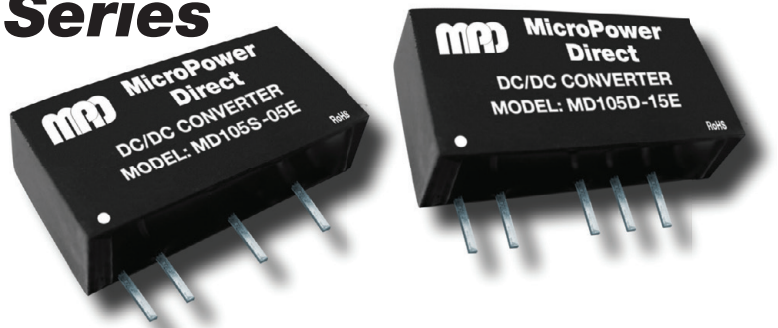


MD100xE Series

Low Cost, SIP, 1W Single & Dual Output DC/DC Converters



Key Features:

- 1W Output Power
- Miniature SIP Case
- Short Circuit Protected
- 1,500 VDC Isolation
- EN 60950 Approved
- >3.5 MHour MTBF
- -40 to +105°C Operation
- LOW COST

3.0 kV Isolation
Models
Available



RoHS



MicroPower Direct

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Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerelectronics.com
W: www.micropowerelectronics.com



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	3.3 VDC Input	2.97	3.3	3.63	VDC
	5 VDC Input	4.50	5.0	5.50	
	9 VDC Input	8.10	9.0	9.90	
	12 VDC Input	10.80	12.0	13.20	
	15 VDC Input	13.50	15.0	16.50	
	24 VDC Input	21.60	24.0	26.40	
Input Filter	Internal Capacitor				

Output					
Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±2.5		%
Line Regulation	3.3 VOUT Models All Other Models	For VIN Change of 1%		±1.5 ±1.2	%
Load Regulation, See Note 1	See Model Selection Guide				
Ripple & Noise (20 MHz)	See Note 2		60	150	mV P - P
Temperature Coefficient				±0.03	%/°C
Output Short Circuit	See Table on Page 2				

General					
Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 0.1V		20		pF
Switching Frequency			100	300	kHz

EMI Characteristics					
Parameter	Standard	Criteria	Level		
Radiated Emissions	EN 55022		Level B		
Conducted Emissions	EN 55022		Level B		
ESD, Single Output, See Note 4	EN 61000-4-2	B	±8 kV Contact		
ESD, Dual Output, See Note 4	EN 61000-4-2	B	±6 kV Contact		

Environmental					
Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical					
Case Size	See Mechanical Diagram (Page 4)				
Case Material	Non-Conductive Black Plastic (UL-94V0)				
Weight	0.08 Oz (2.4g)				

Reliability Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours

Absolute Maximum Ratings					
Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	3.3 VDC Input			5.0	VDC
	5 VDC Input			9.0	
	9 VDC Input			12.0	
	12 VDC Input			18.0	
	15 VDC Input			21.0	
	24 VDC Input			30.0	
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.

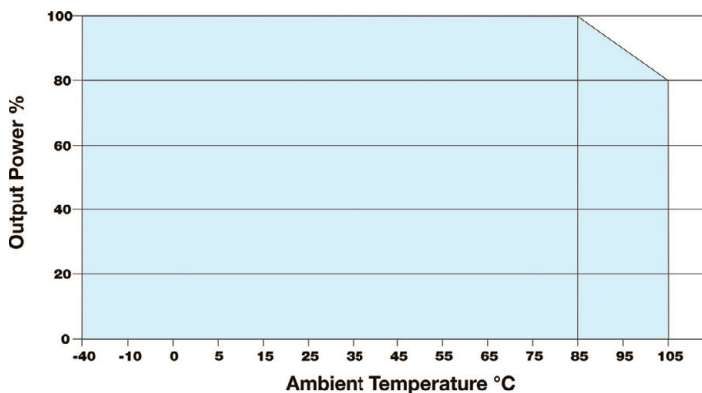
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Model Number	Input				Output			Load Regulation (% Typ)	Output Capacitive Load (μ F Max)	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MD103S-03E	3.3	2.97 - 3.63	420	30	3.3	303.0	31.0	18.0	220	72	800
MD103S-05E	3.3	2.97 - 3.63	388	30	5.0	200.0	20.0	12.0	220	78	800
MD105S-03E	5.0	4.5 - 5.5	267	25	3.3	303.0	31.0	18.0	220	74	500
MD105S-05E	5.0	4.5 - 5.5	270	25	5.0	200.0	20.0	12.0	220	80	500
MD105S-09E	5.0	4.5 - 5.5	250	25	9.0	111.0	11.0	9.0	220	80	500
MD105S-12E	5.0	4.5 - 5.5	250	25	12.0	84.0	9.0	8.0	220	80	500
MD105S-15E	5.0	4.5 - 5.5	250	25	15.0	67.0	7.0	7.0	220	80	500
MD105S-24E	5.0	4.5 - 5.5	250	25	24.0	42.0	5.0	6.0	220	80	500
MD105D-03E	5.0	4.5 - 5.5	282	25	\pm 3.3	\pm 152.0	\pm 15.0	18.0	100	71	500
MD105D-05E	5.0	4.5 - 5.5	250	25	\pm 5.0	\pm 100.0	\pm 10.0	12.0	100	80	500
MD105D-09E	5.0	4.5 - 5.5	250	25	\pm 9.0	\pm 56.0	\pm 6.0	9.0	100	80	500
MD105D-12E	5.0	4.5 - 5.5	250	25	\pm 12.0	\pm 42.0	\pm 5.0	8.0	100	80	500
MD105D-15E	5.0	4.5 - 5.5	250	25	\pm 15.0	\pm 34.0	\pm 4.0	7.0	100	80	500
MD105D-24E	5.0	4.5 - 5.5	250	25	\pm 24.0	\pm 21.0	\pm 3.0	6.0	100	80	500
MD109D-09E	9.0	8.1 - 9.9	139	25	\pm 9.0	\pm 56.0	\pm 6.0	9.0	100	80	300
MD109D-15E	9.0	8.1 - 9.9	139	25	\pm 15.0	\pm 34.0	\pm 4.0	7.0	100	80	300
MD112S-03E	12	10.8 - 13.2	110	15	3.3	303.0	31.0	18.0	220	76	200
MD112S-05E	12	10.8 - 13.2	104	15	5.0	200.0	20.0	12.0	220	80	200
MD112S-09E	12	10.8 - 13.2	104	15	9.0	111.0	11.0	9.0	220	80	200
MD112S-12E	12	10.8 - 13.2	104	15	12.0	84.0	9.0	8.0	220	80	200
MD112S-15E	12	10.8 - 13.2	104	15	15.0	67.0	7.0	7.0	220	80	200
MD112S-24E	12	10.8 - 13.2	104	15	24.0	42.0	5.0	6.0	220	80	200
MD112D-03E	12	10.8 - 13.2	110	15	\pm 3.3	\pm 152.0	\pm 15.0	18.0	100	76	200
MD112D-05E	12	10.8 - 13.2	104	15	\pm 5.0	\pm 100.0	\pm 10.0	12.0	100	80	200
MD112D-09E	12	10.8 - 13.2	104	15	\pm 9.0	\pm 56.0	\pm 6.0	9.0	100	80	200
MD112D-12E	12	10.8 - 13.2	104	15	\pm 12.0	\pm 42.0	\pm 5.0	8.0	100	80	200
MD112D-15E	12	10.8 - 13.2	104	15	\pm 15.0	\pm 34.0	\pm 4.0	7.0	100	80	200
MD112D-24E	12	10.8 - 13.2	104	15	\pm 24.0	\pm 21.0	\pm 3.0	6.0	100	80	200
MD115S-05E	15	13.5 - 16.5	83	10	5.0	200.0	20.0	12.0	220	80	150
MD115S-12E	15	13.5 - 16.5	83	10	12.0	84.0	9.0	8.0	220	80	150
MD115S-15E	15	13.5 - 16.5	84	10	15.0	67.0	7.0	7.0	220	80	150
MD115D-05E	15	13.5 - 16.5	83	10	\pm 5.0	\pm 100.0	\pm 10.0	12.0	100	80	150
MD115D-12E	15	13.5 - 16.5	83	10	\pm 12.0	\pm 42.0	\pm 5.0	8.0	100	80	150
MD115D-15E	15	13.5 - 16.5	83	10	\pm 15.0	\pm 34.0	\pm 4.0	7.0	100	80	150
MD124S-03E	24	21.6 - 26.4	56	7	3.3	303.0	31.0	18.0	220	74	100
MD124S-05E	24	21.6 - 26.4	52	7	5.0	200.0	20.0	12.0	220	80	100
MD124S-09E	24	21.6 - 26.4	52	7	9.0	111.0	11.0	9.0	220	80	100
MD124S-12E	24	21.6 - 26.4	52	7	12.0	84.0	9.0	8.0	220	80	100
MD124S-15E	24	21.6 - 26.4	52	7	15.0	67.0	7.0	7.0	220	80	100
MD124S-24E	24	21.6 - 26.4	52	7	24.0	42.0	5.0	6.0	220	80	100
MD124D-05E	24	21.6 - 26.4	52	7	\pm 5.0	\pm 100.0	\pm 10.0	12.0	100	80	100
MD124D-09E	24	21.6 - 26.4	52	7	\pm 9.0	\pm 56.0	\pm 6.0	9.0	100	80	100
MD124D-12E	24	21.6 - 26.4	52	7	\pm 12.0	\pm 42.0	\pm 5.0	8.0	100	80	100
MD124D-15E	24	21.6 - 26.4	52	7	\pm 15.0	\pm 34.0	\pm 4.0	7.0	100	80	100
MD124D-24E	24	21.6 - 26.4	52	7	\pm 24.0	\pm 21.0	\pm 3.0	6.0	100	80	100

Notes:

- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 1.0 μ F ceramic capacitor and a 10 μ F electrolytic capacitor be connected in parallel from the +Vout pin to the -Vout pin for single output models, or from each output to common for dual output models.
- Operation at no load will not damage these units, however, they may not meet all specifications.
- These converters are specified for operation without external components. However, to meet specific EMC standards, some external components may be required. Typical connections are shown on page three.
- It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection tables for the correct rating.

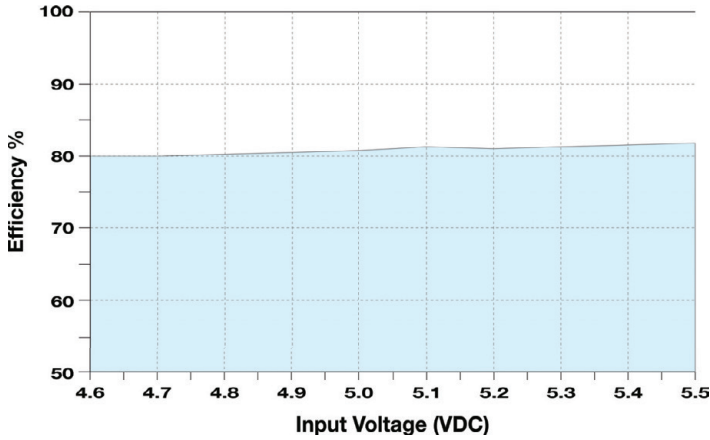
Derating Curve



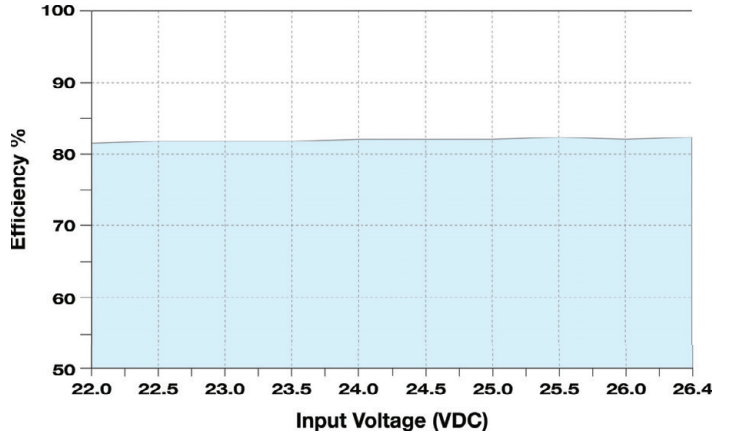
Short Circuit Protection

Model	Short Circuit Protection
MD105S-24E	Momentary (1S)
MD105D-24E	Momentary (1S)
MD124S-03E	Momentary (1S)
MD124S-05E	Momentary (1S)
MD124S-09E	Momentary (1S)
MD124S-12E	Momentary (1S)
MD124S-15E	Momentary (1S)
MD124S-24E	Momentary (1S)
MD124D-05E	Momentary (1S)
MD124D-09E	Momentary (1S)
MD124D-12E	Momentary (1S)
MD124D-15E	Momentary (1S)
MD124D-24E	Momentary (1S)
All Other Models	Continuous (Autorecovery)

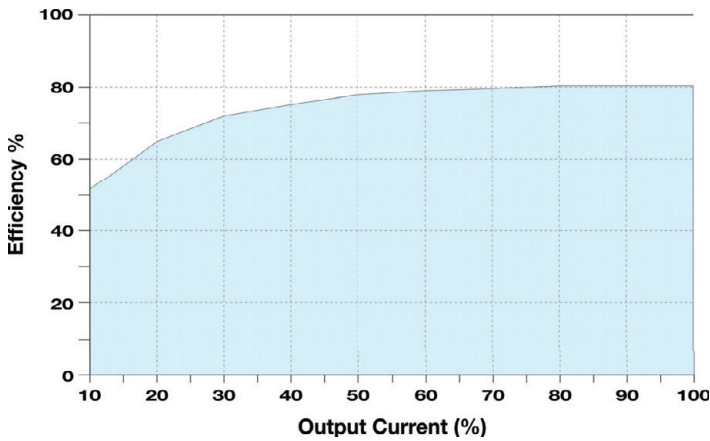
Typical Efficiency vs Input, MD105D-05E



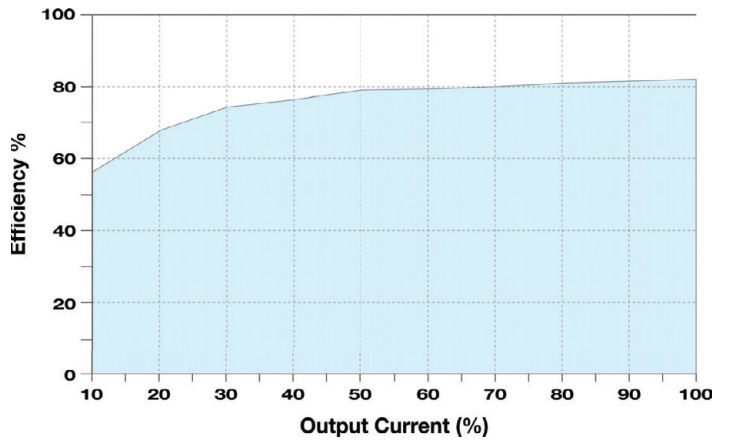
Typical Efficiency vs Input, MD124D-15E



Typical Efficiency vs Output, MD105D-05E

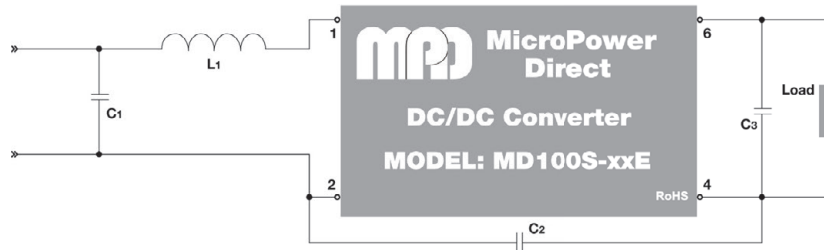


Typical Efficiency vs Output, MD124D-15E



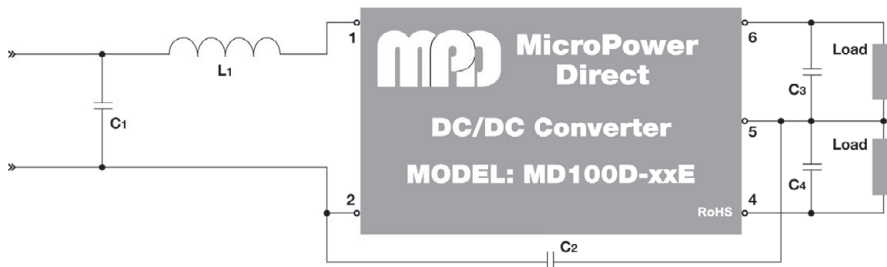
Efficiency vs input is plotted with the unit at full load. Efficiency vs output is plotted with the unit at nominal input.

Typical Connection, Single Output Models



V _{IN}	C ₁	L ₁	C ₂
3.3 VDC	4.7 μ F/50V	6.8 μ H	---
5 VDC	4.7 μ F/50V	6.8 μ H	---
9 VDC	4.7 μ F/50V	6.8 μ H	---
12 VDC	4.7 μ F/50V	6.8 μ H	---
15 VDC	4.7 μ F/50V	6.8 μ H	1.0 nF/2 kV
24 VDC	4.7 μ F/50V	6.8 μ H	1.0 nF/2 kV

Typical Connection, Dual Output Models

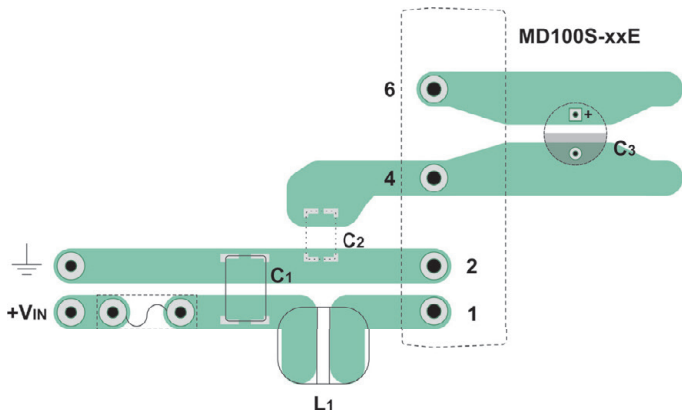


V _{OUT}	C ₃	C ₄
3.3 VDC	10 μ F	---
5.0 VDC	10 μ F	---
9.0 VDC	2.2 μ F	---
12 VDC	2.2 μ F	---
15 VDC	1.0 μ F	---
24 VDC	1.0 μ F	---
\pm 3.3 VDC	4.7 μ F	4.7 μ F
\pm 5.0 VDC	4.7 μ F	4.7 μ F
\pm 9.0 VDC	1.0 μ F	1.0 μ F
\pm 12 VDC	1.0 μ F	1.0 μ F
\pm 15 VDC	0.47 μ F	0.47 μ F
\pm 24 VDC	0.47 μ F	0.47 μ F

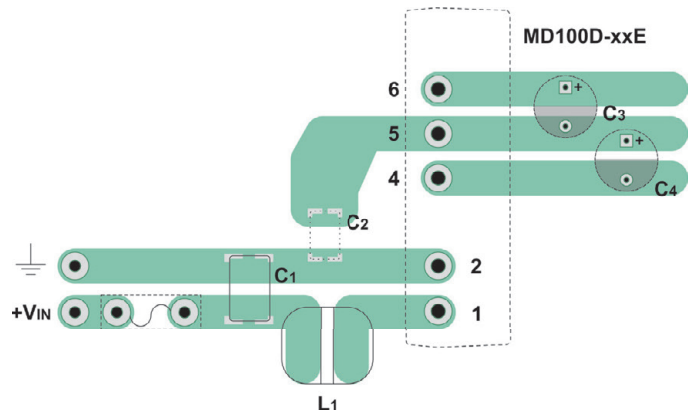
These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors will enhance stability and reduce output ripple. For applications that require meeting EMC standards, the diagrams above illustrates a typical connection of the MD100x-xxE series. Suggested component values are given in the table at right.

Capacitors C₂ and C₃ are not required to meet specifications, but may be used if a lower level of output ripple is required.

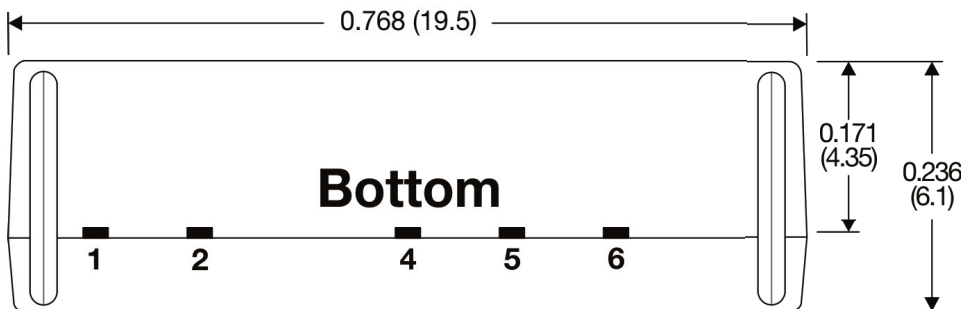
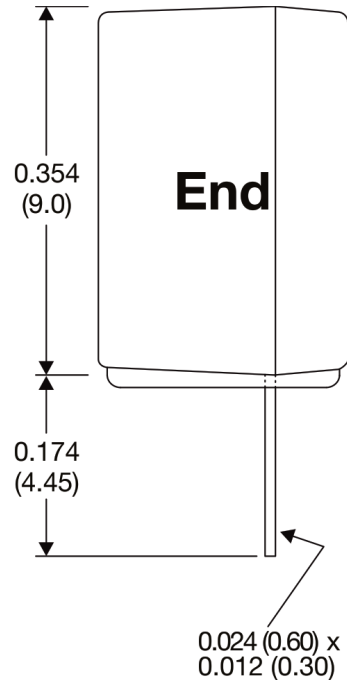
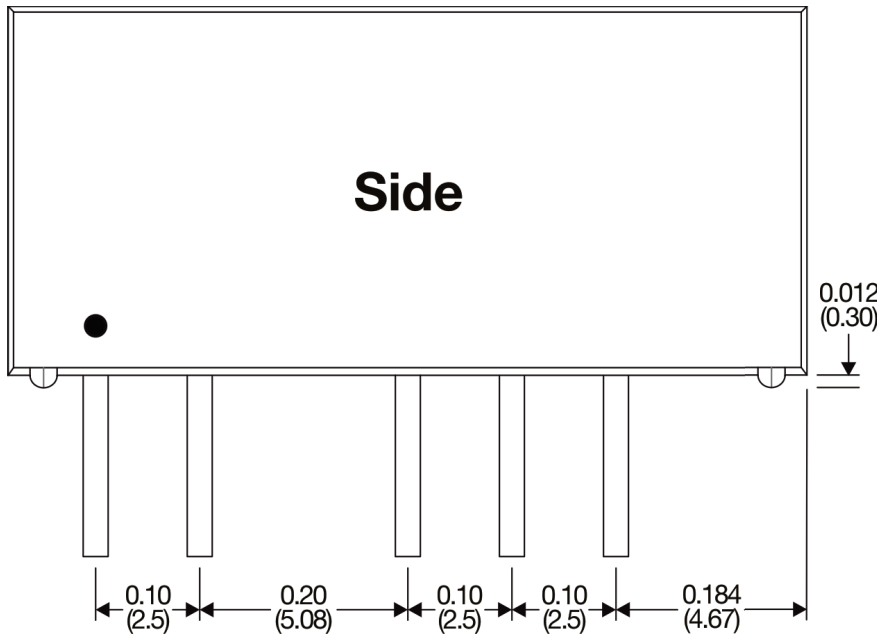
Typical Board Layout, Single Output Models



Typical Board Layout, Dual Output Models



Mechanical Dimensions



Pin Connections

Pin	Single Output
1	+VIN
2	-VIN
4	-VOUT
5	No Pin
6	+VOUT

Pin	Dual Output
1	+VIN
2	-VIN
4	-VOUT
5	Common
6	+VOUT

- Notes:**
- All dimensions are typical in inches (mm)
 - General Tolerance x.xx = ±0.02 (±0.5)
 - Pin 1 is marked by a "dot" or indentation on the unit