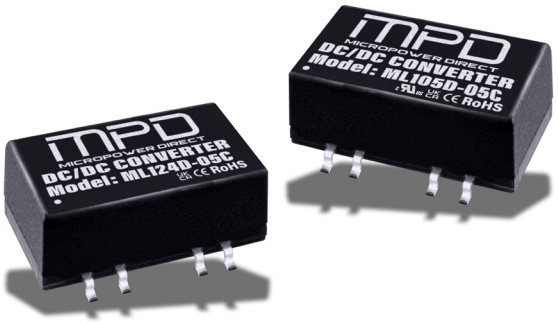
ML100DC

1W, Compact, Isolated DC/DC Converters



Key Features:

- 1W Output Power
- Compact SMD Package
- Dual Output
- Efficiency to 85%
- 1500 VDC Isolation
- -40°C to +105°C Temp
- >3500 kHour MTBF
- Short Circuit Protected
- Tape & Reel Available
- Industry Standard Pin-Out

CE
UK CA
RoHS

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	3.3VDC Input		2.97	3.3	3.63	VDC
	5VDC Input		4.5	5	5.5	
	9VDC Input		10.8	12	13.2	
	15VDC Input		13.5	15	16.5	
	24VDC Input		21.6	24	26.4	
Input Current	See Model Selection Guide					
Reflected Ripple Current	3.3VDC Input			30		mA
	Other Inputs			15		
Surge Voltage (1 sec. max.)	3.3VDC Input		-0.7		5	VDC
	5VDC Input		-0.7		9	
	12VDC Input		-0.7		18	
	15VDC Input		-0.7		21	
	24VDC Input		-0.7		30	
Input Filter	Capacitance Filter					

Output

Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy	See Output Regulation Curves on p. 3					
Line Regulation (Vin Variation ±1%)	3.3/5VDC Inputs	3.3VDC Output		±1.5		%
	Other Inputs			±1.2		
Load Regulation (10% - 100% Load)	See Page 2					
Ripple & Noise (20MHz Bandwidth)	3.3VDC Input			50	100	mV P-P
	Other Inputs	24VDC Output		50	100	
		Other Outputs		30	75	
Temperature Coefficient	Full Load			±0.02		%/°C
Output Short Circuit Protection	Continuous, self-recovery					

General

Parameter	Conditions		Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds, leakage <1mA		1500			VDC
Isolation Resistance	500 VDC		1000			MΩ
Isolation Capacitance	100 KHz /0.1V			20		pF
Switching Frequency	Full load, nominal Vin	3.3VDC Input		220		kHz
		5VDC Input		270		
		12/15/24VDC In		260		

Environmental

Parameter	Conditions		Min.	Typ	Max.	Units
Operating Temperature Range	3.3VDC Input	Derating ≥85°C	-40		+105	°C
	Other Inputs	Derating ≥100°C				
Storage Temperature Range			-55		+125	°C
Case Temperature Rise (Ta=25°C)	5VDC Input	3.3VDC Output		25		°C
		Other Outputs		15		
	Other Inputs			25		
Cooling	Free Air Convection					
Storage Humidity	Non-Condensing		5		95	%RH
Vibration	10-150Hz, 5G, 0.75mm along X, Y, Z axis					

Physical

Case Size	0.6 x 0.45 x 0.29 in (See mechanical drawing on page 6)
Case Material	Black plastic; flame retardant and heat resistant (UL94V-0)
Weight	0.049 oz (1.4g) (See mechanical drawing on page 6)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	3500			kHours
Reflow Soldering Temperature	Peak temp ≤245°C, maximum duration time ≤60s over 217°C				
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1 Level 1				

EMI Characteristics

Parameter	Conditions		Criteria	Level
Radiated Emissions	CISPR/EN 55032			Class B
Conducted Emissions	CISPR/EN 55032			Class B
ESD	IEC/EN 61000-4-2	5VDC Input	B	±8kV Air, ±4kV Contact
		Other Inputs		±8kV Air, ±6kV Contact

MicroPower Direct
46 Eastman Street
Unit 1
South Easton, MA 02375
USA

T: (781) 344-8226
E: sales@micropowerdirect.com
W: www.micropowerdirect.com

MPD
MICROPOWER DIRECT

Model Selection Guide

UL	Model Number	Input				Output			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA, Typ)	Capacitive Load (uF Max) (See Note 1)	Fuse Rating Slow-Blow (mA)
		Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min.)				
		Nominal	Range	Full-Load (Typ)	No-Load							
	ML103D-03C	3.3	2.97 - 3.63	394	12	±3.3	±152	±15	77	30	1200	1000
	ML103D-05C	3.3	2.97 - 3.63	370	12	±5	±100	±10	82	30	1200	1000
	ML103D-09C	3.3	2.97 - 3.63	370	12	±9	±56	±5	82	30	470	1000
	ML103D-12C	3.3	2.97 - 3.63	370	12	±12	±42	±5	82	30	220	1000
	ML103D-15C	3.3	2.97 - 3.63	370	12	±15	±34	±4	82	30	220	1000
	ML103D-24C	3.3	2.97 - 3.63	361	12	±24	±21	±2	84	30	100	1000
	ML105D-03C	5	4.5 - 5.5	270	8	±3.3	±152	±15	74	15	1200	600
▪	ML105D-05C	5	4.5 - 5.5	244	8	±5	±100	±10	82	15	1200	600
	ML105D-09C	5	4.5 - 5.5	241	12	±9	±56	±6	83	15	470	600
	ML105D-12C	5	4.5 - 5.5	241	12	±12	±42	±5	83	15	220	600
	ML105D-15C	5	4.5 - 5.5	241	18	±15	±34	±4	83	15	220	600
	ML105D-24C	5	4.5 - 5.5	241	18	±24	±21	±3	85	15	100	600
	ML112D-05C	12	10.8 - 13.2	102	8	±5	±100	±10	82	15	1200	250
	ML112D-07C	12	10.8 - 13.2	102	8	±7.5	±67	±7	82	15	470	250
	ML112D-09C	12	10.8 - 13.2	101	8	±9	±56	±6	83	15	470	250
	ML112D-12C	12	10.8 - 13.2	101	8	±12	±42	±5	83	15	220	250
	ML112D-15C	12	10.8 - 13.2	101	8	±15	±34	±4	83	15	220	250
	ML112D-24C	12	10.8 - 13.2	99	8	±24	±21	±3	85	15	100	250
	ML115D-15C	15	13.5 - 16.5	81	8	±15	±34	±4	83	15	220	200
	ML124D-05C	24	21.6 - 26.4	51	8	±5	±100	±10	82	15	1200	125
	ML124D-09C	24	21.6 - 26.4	51	8	±9	±56	±6	83	15	470	125
	ML124D-12C	24	21.6 - 26.4	51	8	±12	±42	±5	83	15	220	125
	ML124D-15C	24	21.6 - 26.4	51	8	±15	±34	±4	83	15	220	125
	ML124D-24C	24	21.6 - 26.4	50	8	±24	±21	±3	85	15	100	125
	* ML105D-05C has UL/cUL 62368 approval. Contact factory for safety standard status of other models.											

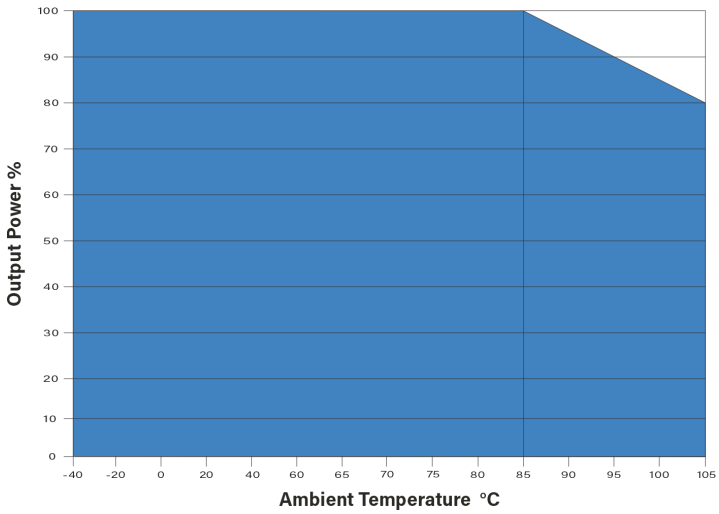
Notes:

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
2. The "parallel cable" method is used for ripple and noise test.
3. The maximum capacitive load is tested within the input voltage range and under full load conditions.
4. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity <75% RH, nominal input voltage, and rated output load.

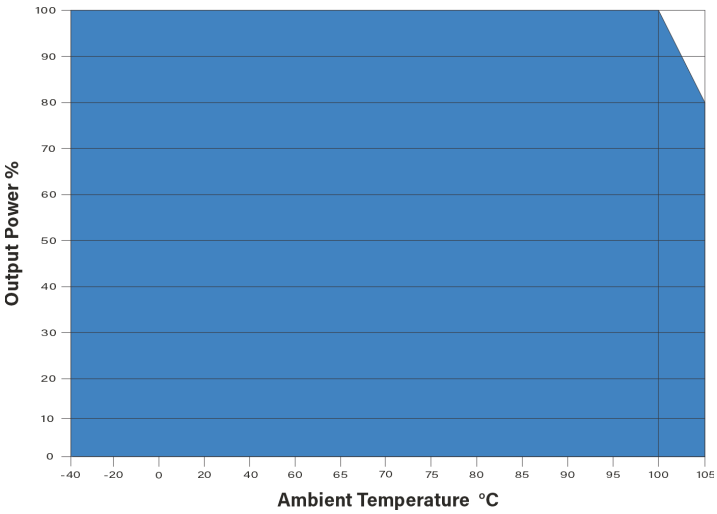
For the tape & reel option, add the suffix "**-TR**" to the model number (i.e. **ML105D-05C-TR**). See page 7.

Parameter	Conditions		Min.	Typ.	Max.	Units
Load Regulation (10% - 100% Load)	3.3VDC Input	3.3VDC Out		15	20	%
		Other Outputs		10	15	
	5VDC Input	3.3VDC Out		15	20	
		5VDC Out		10	15	
		9VDC Out		8	10	
		12VDC Out		7	10	
		15VDC Out		6	10	
		24VDC Out		5	10	
	12/15/24VDC Input	5/7.5VDC Out		5	15	
		9/12/15VDC Out		3	10	
		24VDC Out		2	10	

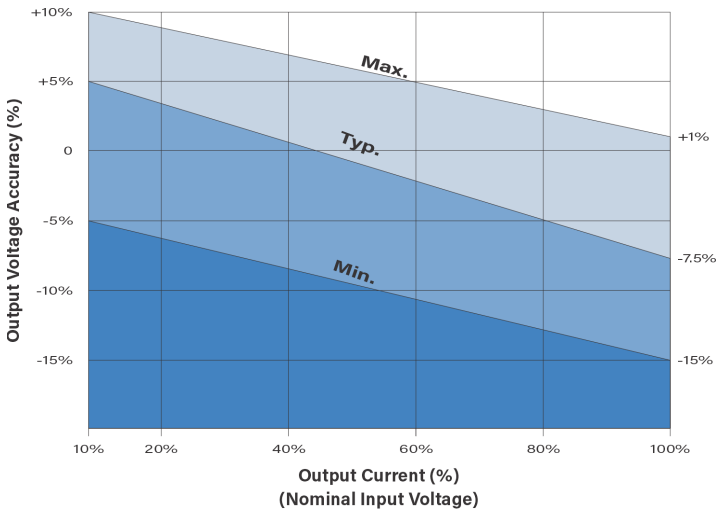
Temperature Derating: 3.3V Input



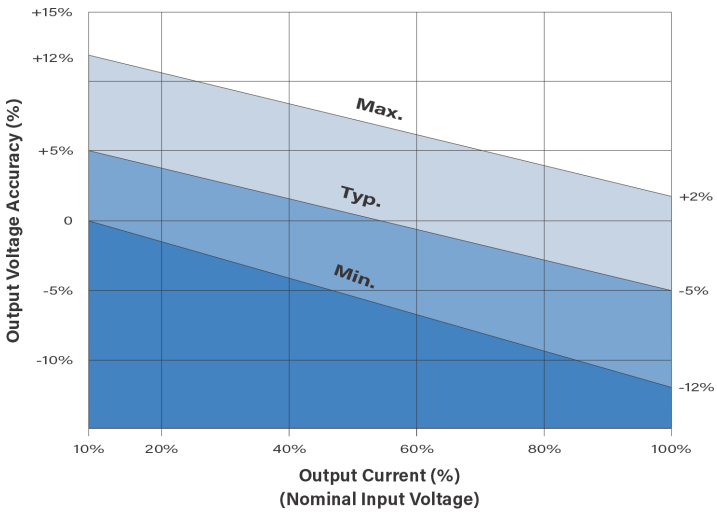
Temperature Derating: Other Inputs



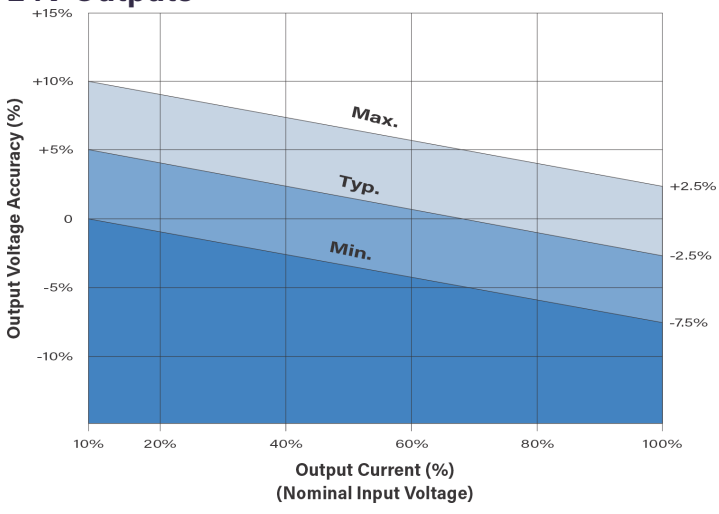
Output Regulation: 3.3V Input, 3.3V Output



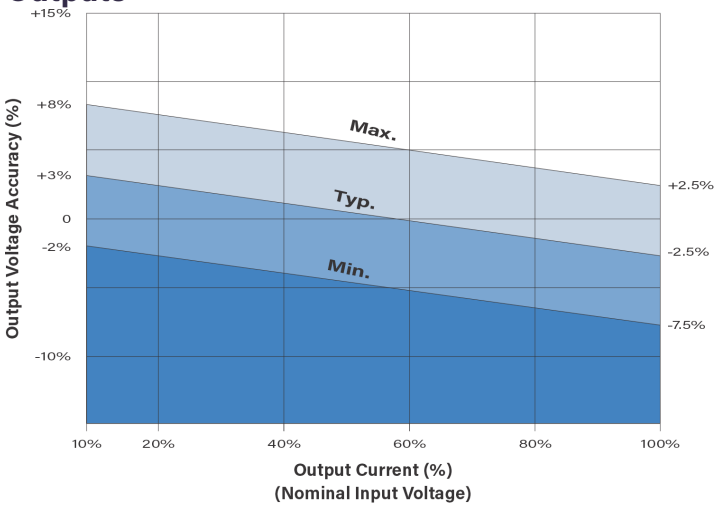
Output Regulation: 5V Input, 3.3V Output



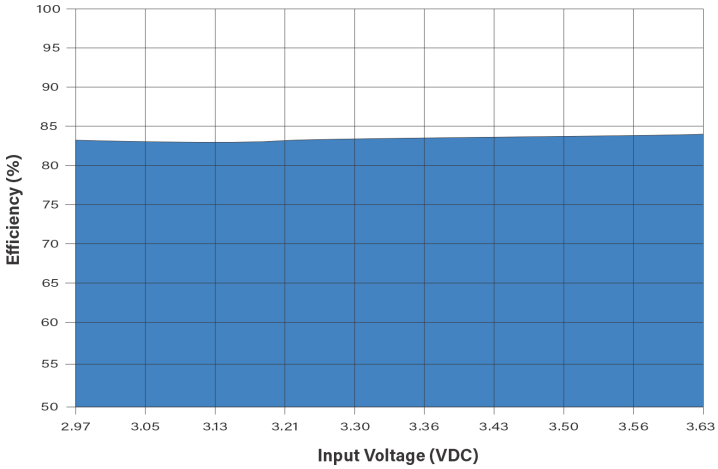
Output Regulation: 3.3/5V Input, 5/9/12/15/ 24V Outputs



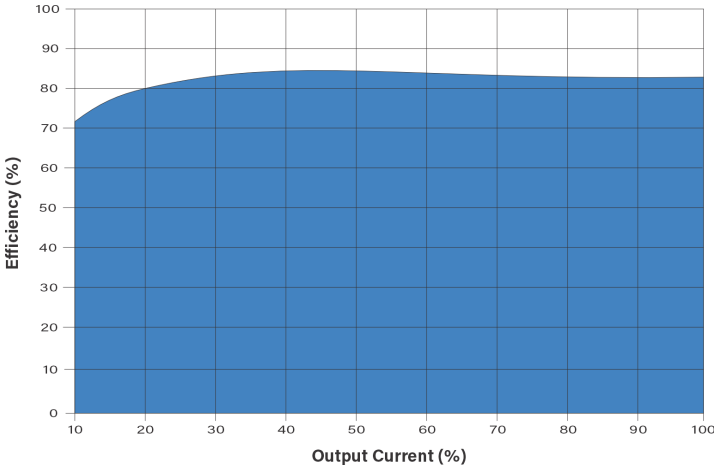
Output Regulation: 12/15/24V Inputs, All Outputs



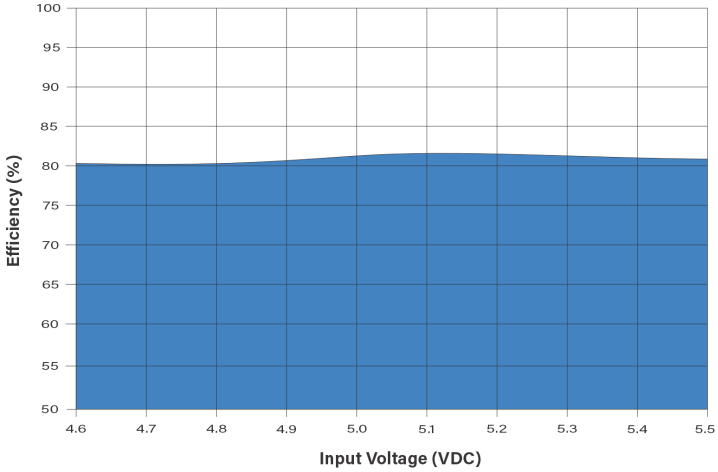
Efficiency vs Input Voltage: ML103D-05C



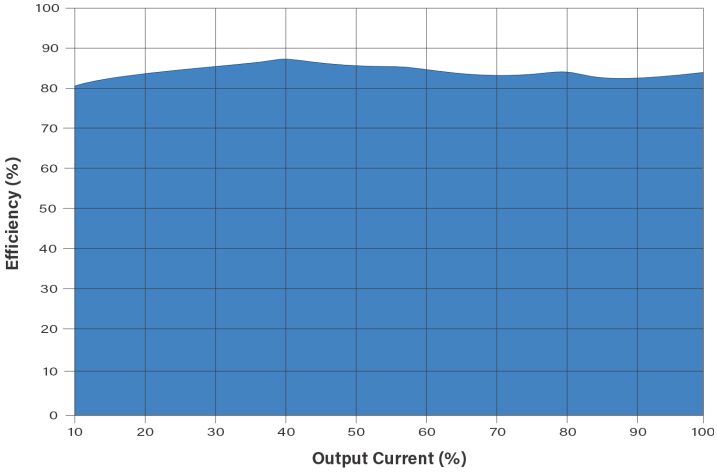
Efficiency vs Output Load: ML103D-05C



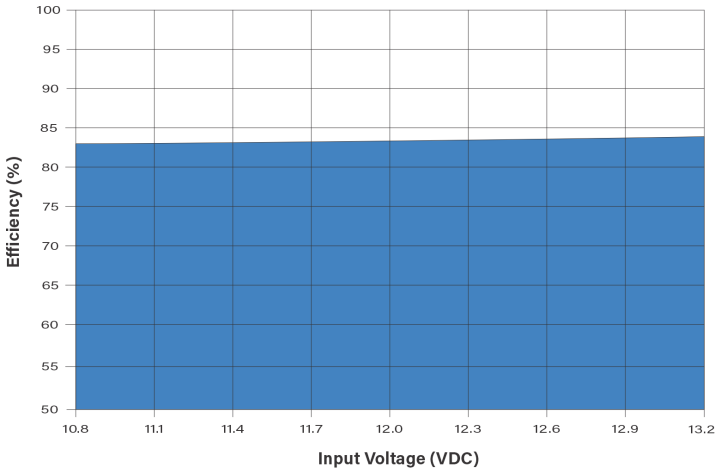
Efficiency vs Input Voltage: ML105D-05C



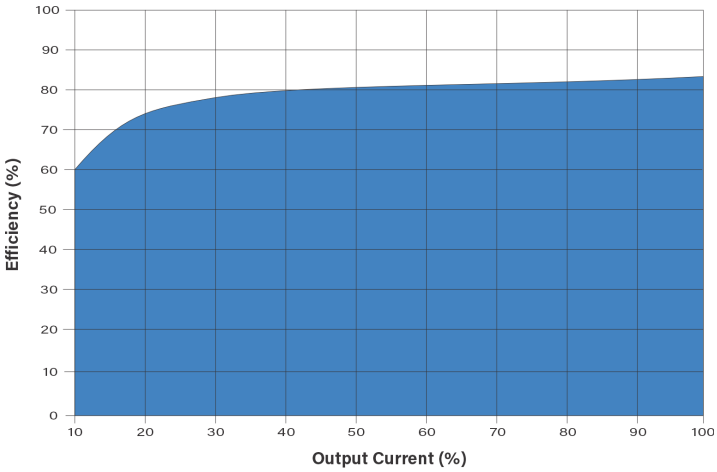
Efficiency vs Output Load: ML105D-05C



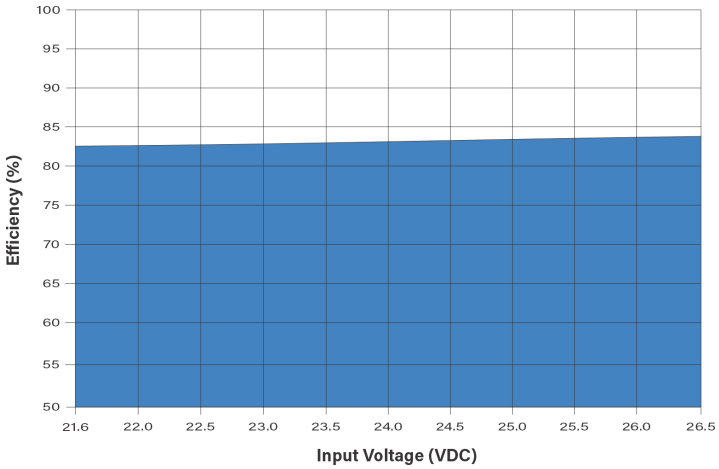
Efficiency vs Input Voltage: ML112D-05C



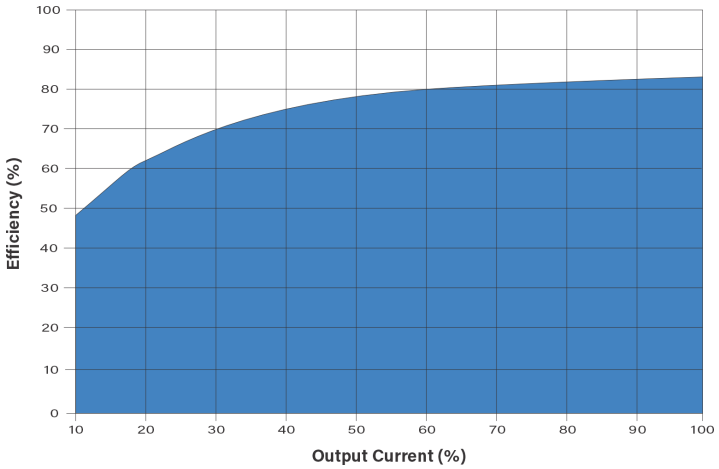
Efficiency vs Output Load: ML112D-05C



Efficiency vs Input Voltage: ML124D-05C



Efficiency vs Output Load: ML124D-05C



Typical Application Circuit

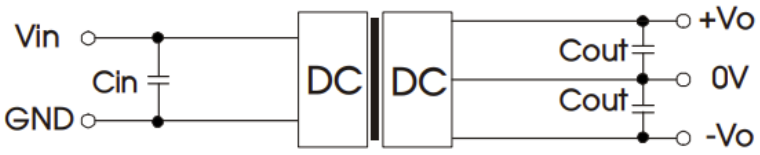


Fig. 1

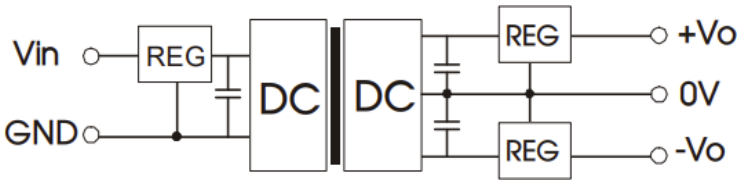


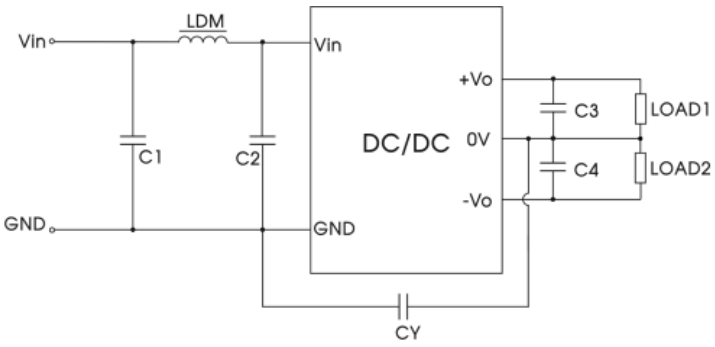
Fig. 2

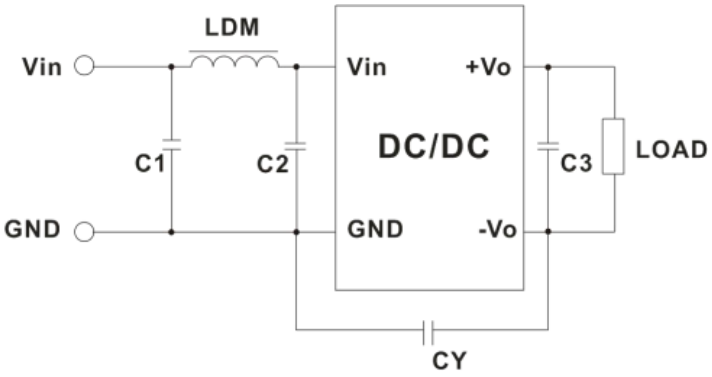
Recommended Capacitive Load Values			
Vin (VDC)	**Cin**	**Vout (VDC)**	**Cout**
3.3	10uF/16V	±3.3	10uF/16V
5	4.7uF/16V	±5	4.7uF/16V
12	2.2uF/25V	±7.5	1uF/16V
15		±9	
24	1uF/50V	±12	1uF/25V
-	-	±15	0.47uF/25V
-	-	±24	0.47uF/50V

Notes:

1. To further reduce input and output ripple, a capacitor filtering network can be connected at the input and output terminals. It is important to choose suitable filter capacitor values for smooth operation of the module, particularly to avoid start-up problems caused by capacitor values that are too high. Refer to the table above for recommended input and output capacitor values.
2. The simplest device for output voltage regulation, over-voltage and under-voltage protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series. See Fig. 2.

EMC Recommended Circuit

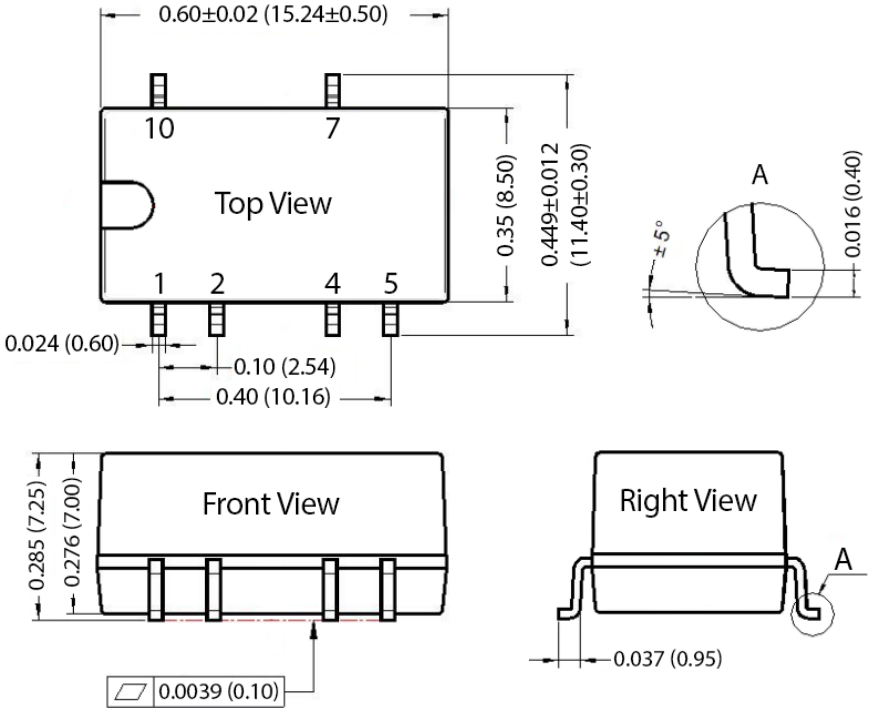


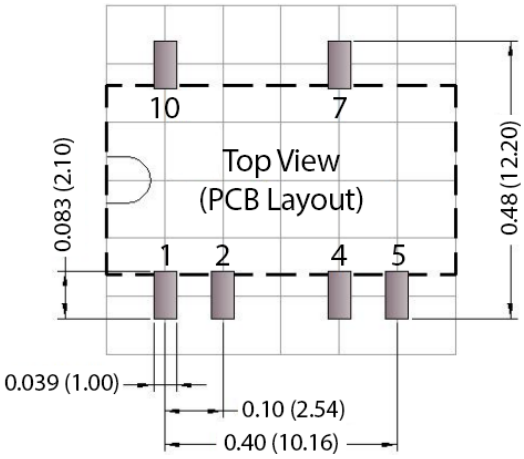


Recommended EMC Values				
Input Voltage	**3.3VDC Input**	**5VDC Input**		**12/15/24VDC Input**
Output Voltage	**-**	**3.3/5/9 VDC**	**12/15/24 VDC**	**-**
C1/C2	4.7uF/16V	4.7uF/25V		4.7uF/50V
CY	270pF/4kV	47pF/2kV	1nF/2kV	270pF/2kV
C3	Refer to Cout in table above			
LDM	6.8uH			

Mechanical Dimensions

THIRD ANGLE PROJECTION





Note: Grid distance is 2.54 * 2.54 mm

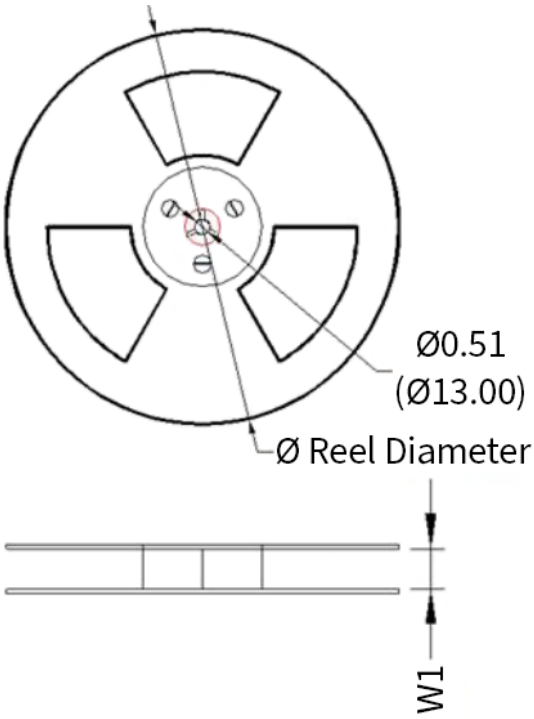
Pin	Function
1	GND
2	Vin
4	0V
5	-Vo
7	+Vo
10	NC

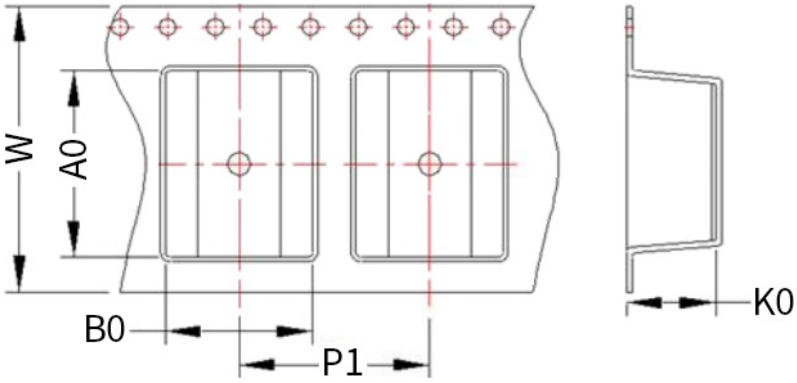
NC: Pin isolated from circuitry

Note:

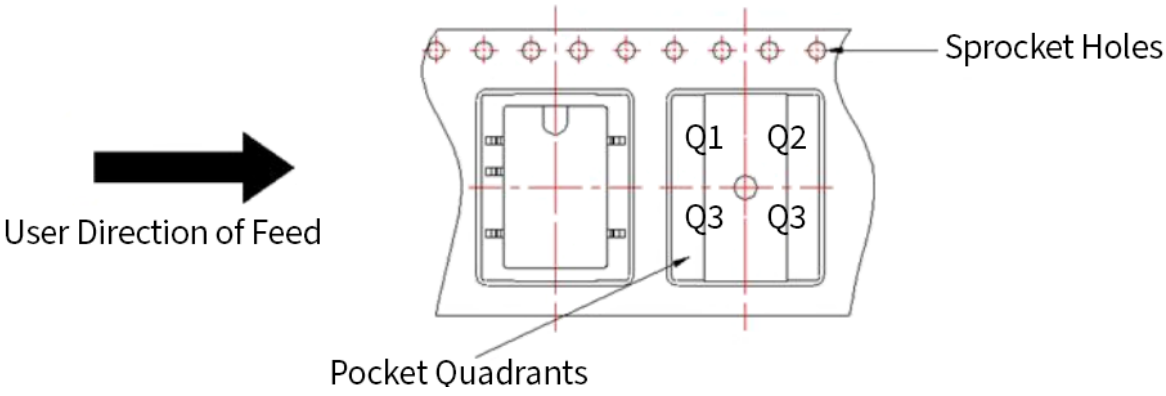
- Unit: inches (mm)
- Pin section tolerances: ±0.004 (±0.10)
- General tolerances: ±0.010 (±0.25)
- Weight: 0.049 oz (1.4g)

Tape and Reel





Quadrant Assignments for PIN 1 Orientation in Tape



Package Type	Pin	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
SMD	6	500	330.0	24.5	15.64	12.4	7.45	16.0	24.0	Q1