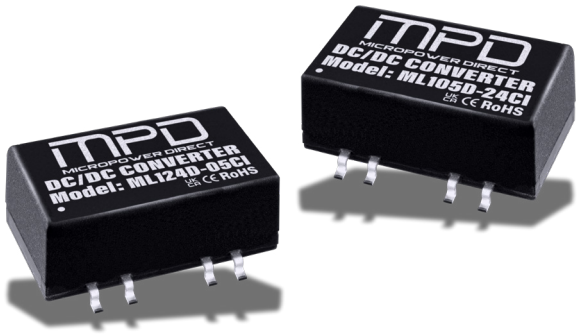
ML100DCI

1W, Compact, Dual Output, High Isolation DC/DC Converters



Key Features:

- 1W Output Power
- Compact SMD Package
- Dual Output
- Efficiency to 84%
- 3000 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	
	12VDC 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	Input Voltage Variation ±1%	3.3VDC Output		±1.5		%
		Other Outputs		±1.2		
Load Regulation (10% - 100% Load)	See Page 2					
Ripple & Noise (20MHz Bandwidth)	3.3VDC Input			50	100	mV P-P
	5/12/15/24VDC Input	Other Outputs		30	75	
		24VDC Output		50	100	
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		3000			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	0.60 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				

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	B	±8kV Air, ±6kV Contact

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MPD
MICROPOWER DIRECT

Model Selection Guide

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-03CI	3.3	2.97 - 3.63	394	12	±3.3	±152	±15	77	30	1200	900
ML103D-05CI	3.3	2.97 - 3.63	370	12	±5	±100	±10	82	30	1200	900
ML103D-09CI	3.3	2.97 - 3.63	370	12	±9	±56	±5	82	30	470	900
ML103D-12CI	3.3	2.97 - 3.63	370	12	±12	±42	±5	82	30	220	900
ML103D-15CI	3.3	2.97 - 3.63	370	12	±15	±34	±4	82	30	220	900
ML103D-24CI	3.3	2.97 - 3.63	361	12	±24	±21	±2	84	30	100	900
ML105D-03CI	5	4.5 - 5.5	270	5	±3.3	±152	±15	74	15	1200	600
ML105D-05CI	5	4.5 - 5.5	244	5	±5	±100	±10	82	15	1200	600
ML105D-09CI	5	4.5 - 5.5	241	12	±9	±56	±6	83	15	470	600
ML105D-12CI	5	4.5 - 5.5	241	12	±12	±42	±5	83	15	220	600
ML105D-15CI	5	4.5 - 5.5	241	18	±15	±34	±4	83	15	220	600
ML105D-24CI	5	4.5 - 5.5	241	18	±24	±21	±3	85	15	100	600
ML112D-05CI	12	10.8 - 13.2	102	8	±5	±100	±10	82	15	1200	250
ML112D-07CI	12	10.8 - 13.2	67	8	±7.5	±67	±7	82	15	470	250
ML112D-09CI	12	10.8 - 13.2	101	8	±9	±56	±6	83	15	470	250
ML112D-12CI	12	10.8 - 13.2	101	8	±12	±42	±5	83	15	220	250
ML112D-15CI	12	10.8 - 13.2	101	8	±15	±34	±4	83	15	220	250
ML112D-24CI	12	10.8 - 13.2	99	8	±24	±21	±3	85	15	100	250
ML115D-15CI	15	13.5 - 16.5	81	8	±15	±34	±4	83	15	220	200
ML124D-05CI	24	21.6 - 26.4	51	8	±5	±100	±10	82	15	1200	125
ML124D-09CI	24	21.6 - 26.4	51	8	±9	±56	±6	83	15	470	125
ML124D-12CI	24	21.6 - 26.4	51	8	±12	±42	±5	83	15	220	125
ML124D-15CI	24	21.6 - 26.4	51	8	±15	±34	±4	83	15	220	125
ML124D-24CI	24	21.6 - 26.4	50	8	±24	±21	±3	85	15	100	125

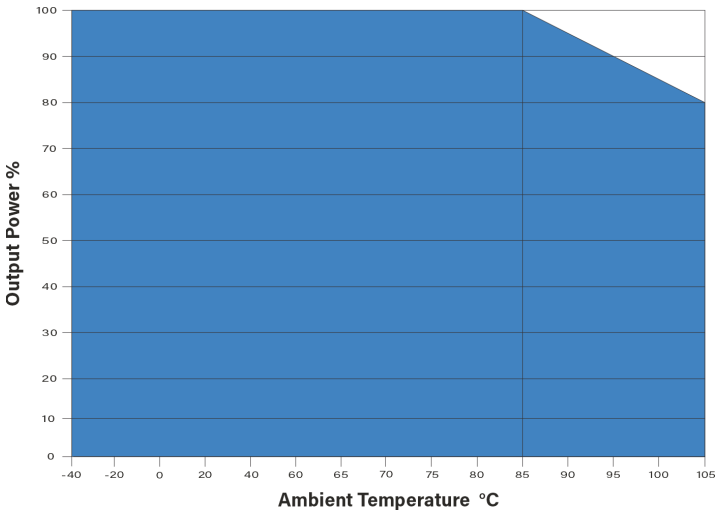
Notes:

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.

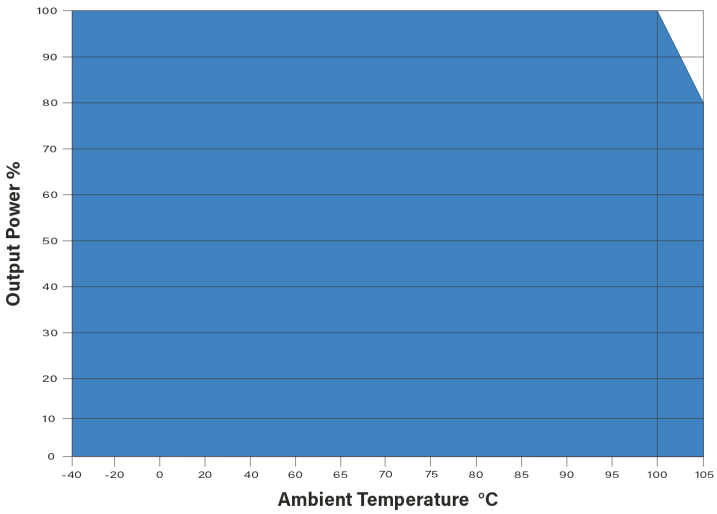
For the tape & reel option, add the suffix "**-TR**" to the model number (i.e. **ML112D-24CI-TR**).

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

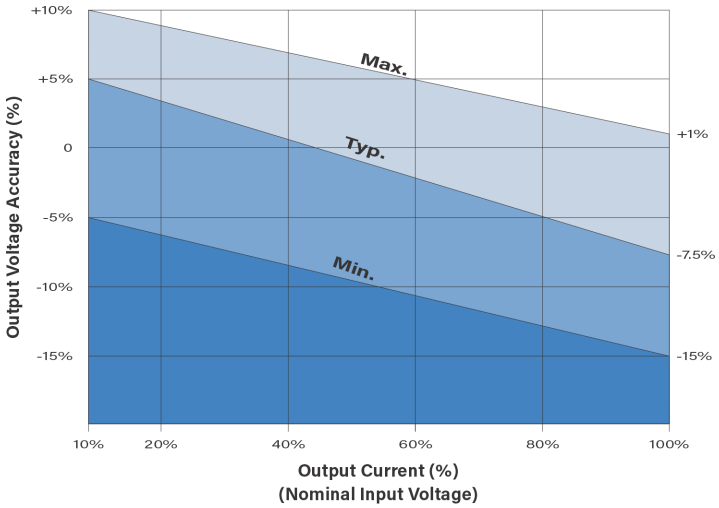
Temperature Derating: 3.3V Input



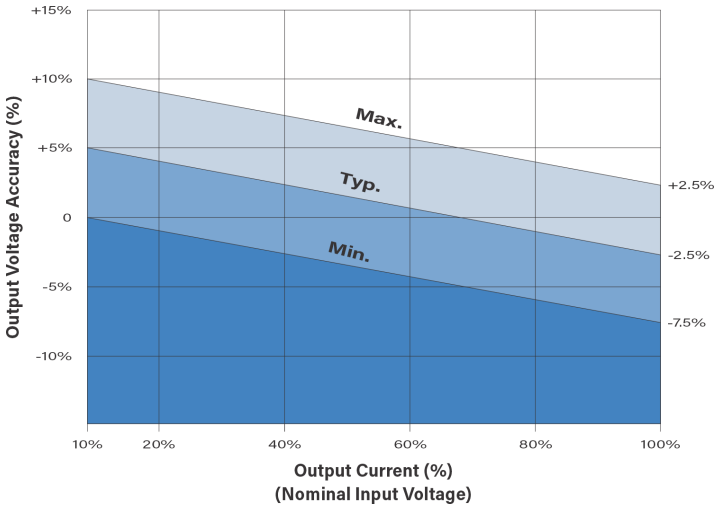
Temperature Derating: Other Inputs



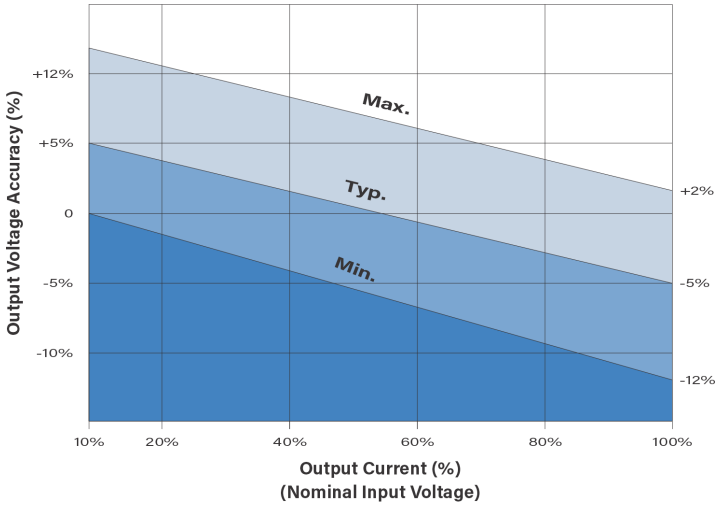
Output Regulation: 3.3V Input, 3.3V Output



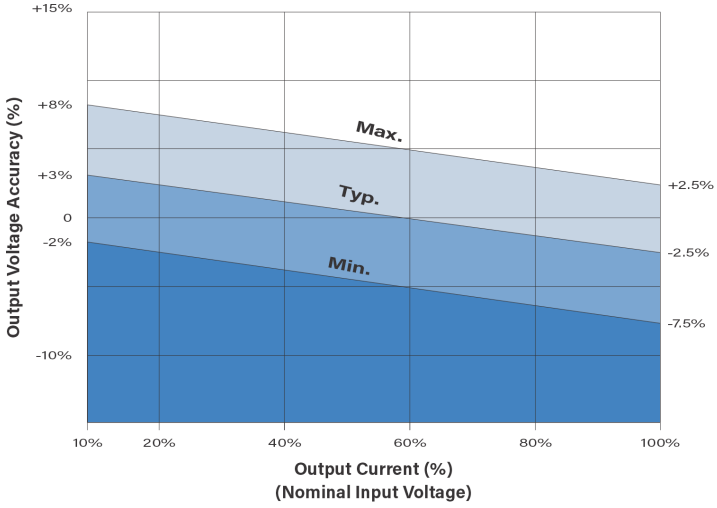
Output Regulation: 3.3/5V Input, Other Outputs



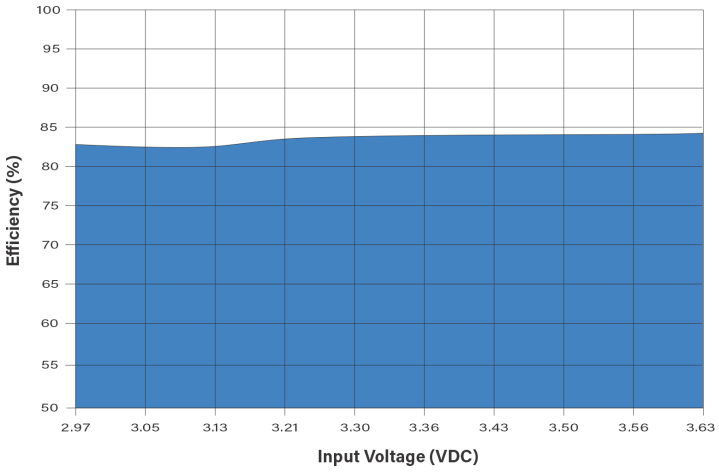
Output Regulation: 5V Input, 3.3VDC Output



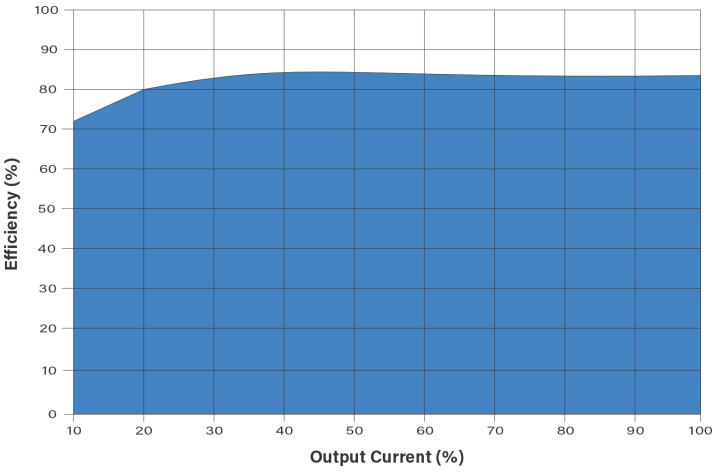
Output Regulation: 12/15/24V Input



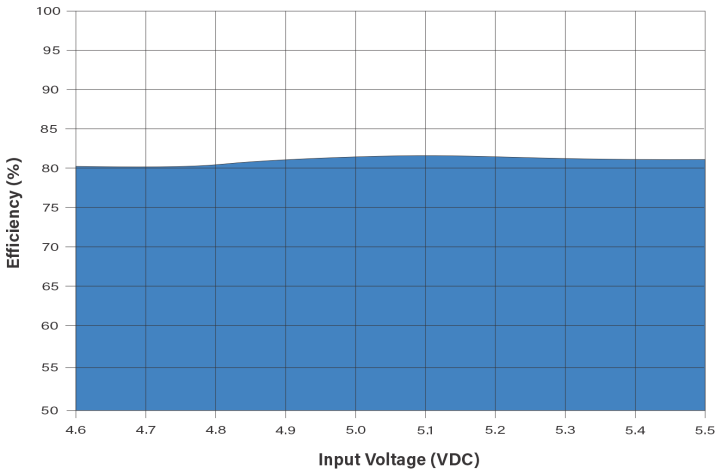
Efficiency vs Input Voltage: ML103D-05CI



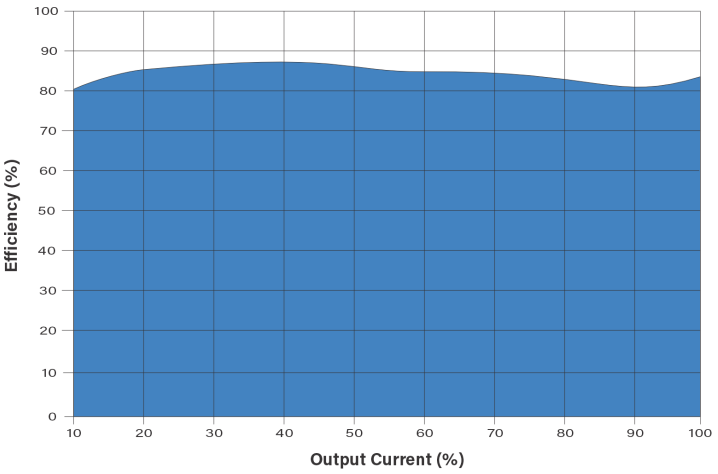
Efficiency vs Output Load: ML103D-05CI



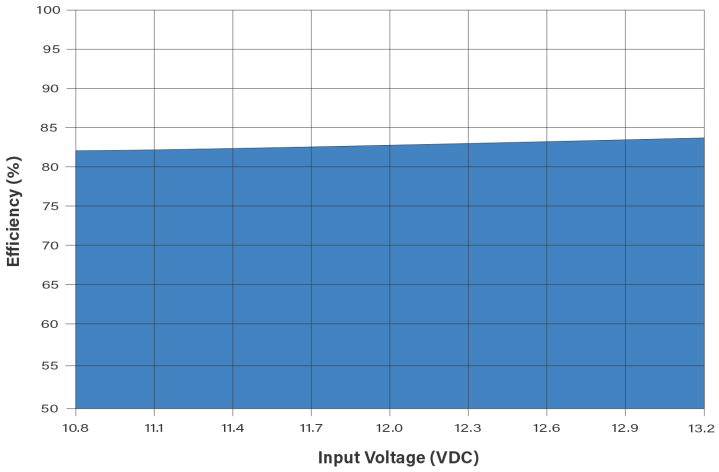
Efficiency vs Input Voltage: ML105D-05CI



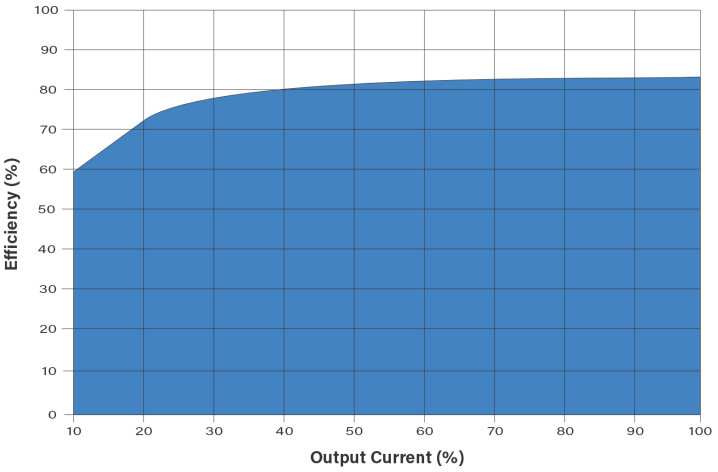
Efficiency vs Output Load: ML105D-05CI



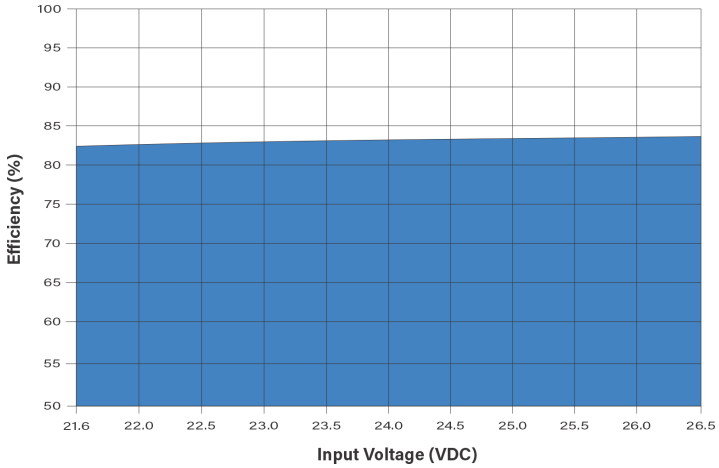
Efficiency vs Input Voltage: ML112D-05CI



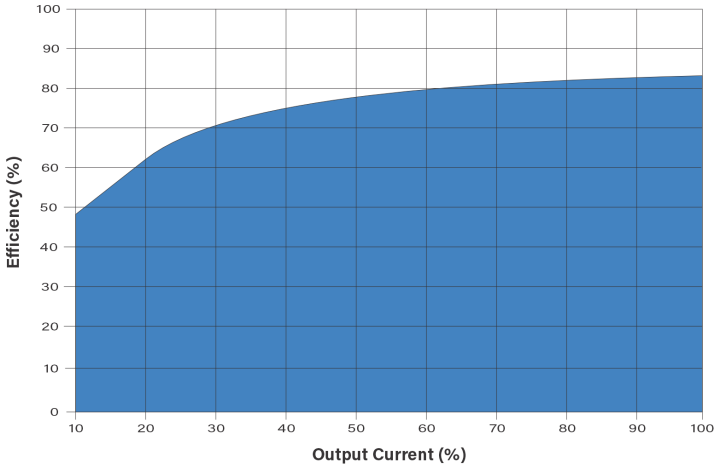
Efficiency vs Output Load: ML112D-05CI



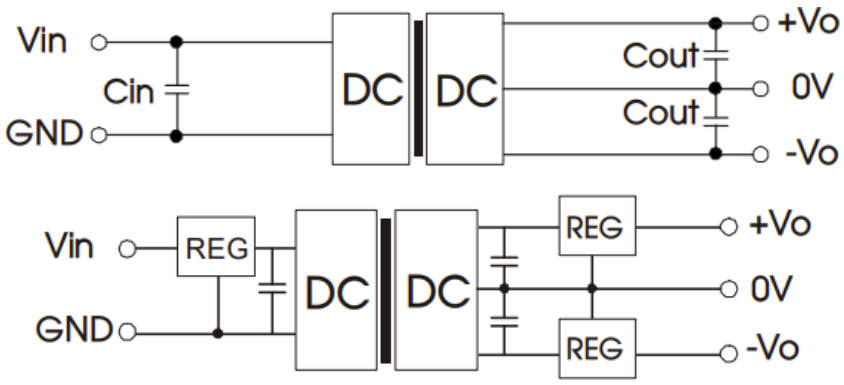
Efficiency vs Input Voltage: ML124D-05CI



Efficiency vs Output Load: ML124D-05CI



Typical Application Circuit

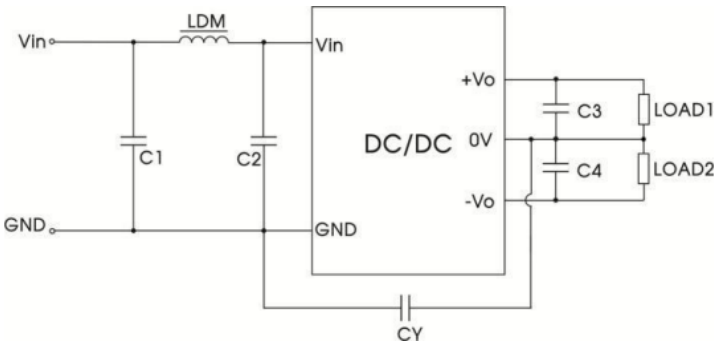


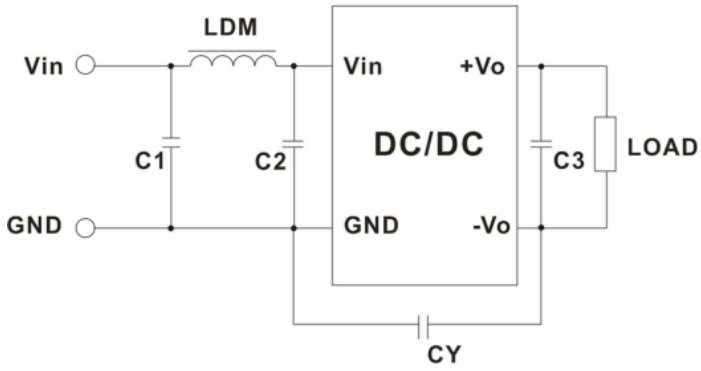
Recommended Capacitive Load Values			
Vin (VDC)	**Cin**	**Vout (VDC)**	**Cout**
3.3	10uF/16V	±3.3	10uF/16V
5	4.7uF/16V	±5	4.7uF/16V
12	2.2uF/25V	±7.5	1uF/16V
15		±9	
24	1uF/50V	±12	1uF/25V
-	-	±15	0.47uF/25V
-	-	±24	0.47uF/50V

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.

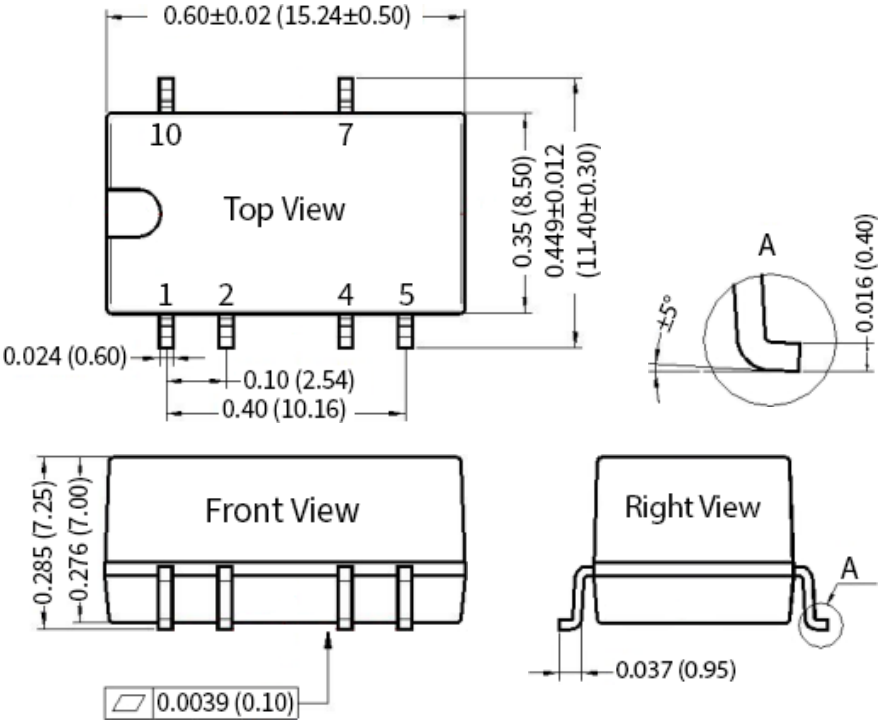
EMC Recommended Circuit

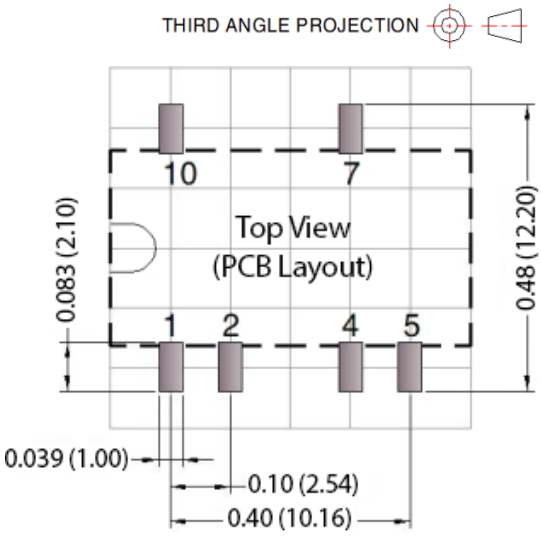




Recommended EMC Values				
Input Voltage	**3.3VDC In**	**5VDC In**		**12/15/24VDC In**
Output Voltage	**3.3/5/9/12/15/24 VDC**	**3.3/5/9 VDC**	**12/15/24 VDC**	**5/7.5/9/12/15/24 VDC**
C1/C2	4.7uF/16V	4.7uF/25V		4.7uF/50V
CY	270pF/4kV	100pF/4kV	1000pF/4kV	270pF/3kV
C3	Refer to Cout above			
LDM	6.8uH			

Mechanical Dimensions





Note: Grid distance is 2.54 * 2.54 mm

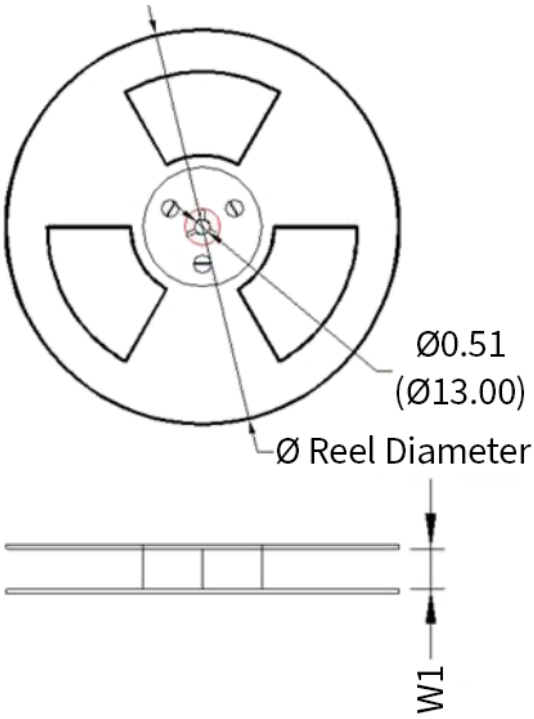
Pin	Function
1	GND
2	Vin
4	0V
5	-Vo
7	+Vo
10	NC

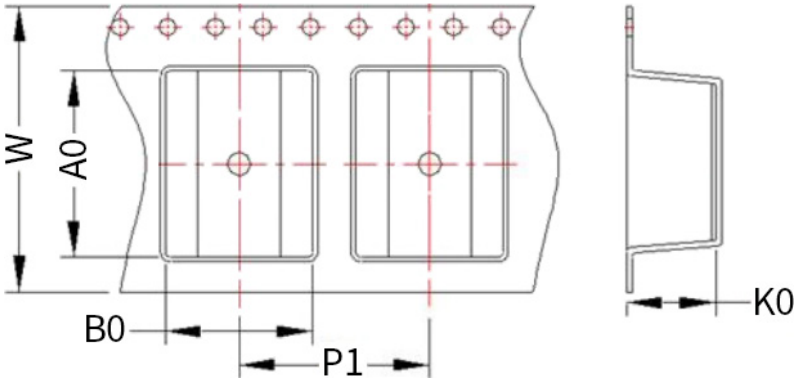
NC: Pin isolated from circuitry

Note:

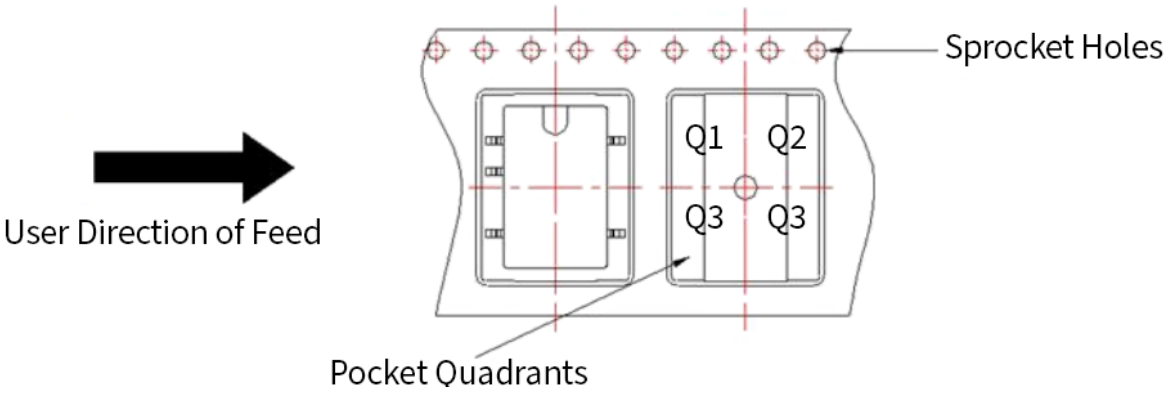
- Unit: inches (mm)
- Pin section tolerances: ±0.004 (±0.10)
- Weight: 0.049 oz (1.4g)
- General tolerances: ±0.010 (±0.25)

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