ML100SC

1W, Compact, Isolated DC/DC Converters

Key Features:

- 1W Output Power
- Compact SMD Package
- Single Output
- Efficiency to 84%
- 1500 VDC Isolation
- -40°C to +105°C Temp
- >3500 kHour MTBF
- Short Circuit Protected
- Industry Standard Pin-Out

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				30		mA
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)				50	100	mV P-P
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	0.52 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	B	±8kV Air, ±4kV Contact
		Other		±8kV Air, ±6kV Contact

CE
UKCA
RoHS

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MPD
MICROPOWER DIRECT

Model Selection Guide

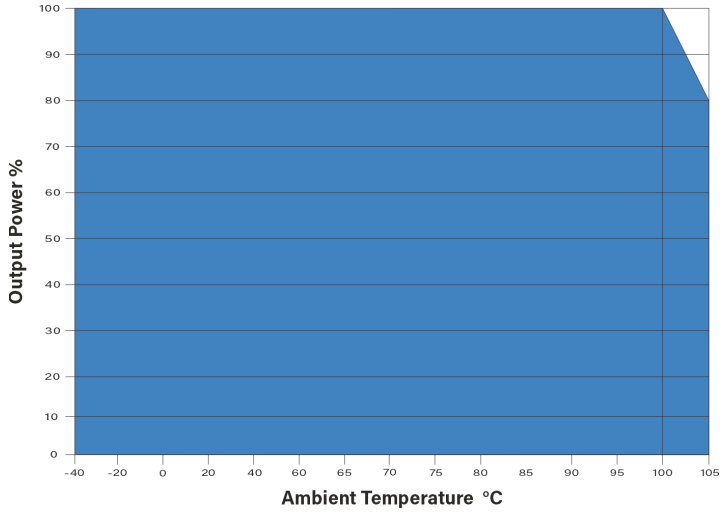
UL	Model Number	Input				Output			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA, Typ)	Capacitive Load (uF Max) (See Note 1)	Fuse Rating Slow-Blow (mA)
		Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min.)				
		Nominal	Range	Full-Load (Typ)	No-Load							
	ML103S-03C	3.3	2.97 - 3.63	394	12	3.3	303	30	77	30	2400	900
▪	ML103S-05C	3.3	2.97 - 3.63	370	12	5	200	20	82	30	2400	900
	ML103S-09C	3.3	2.97 - 3.63	361	12	9	111	11	84	30	1000	900
	ML103S-12C	3.3	2.97 - 3.63	361	12	12	83	8	84	30	560	900
	ML103S-15C	3.3	2.97 - 3.63	361	12	15	67	7	84	30	560	900
	ML103S-24C	3.3	2.97 - 3.63	361	12	24	42	4	84	30	220	900
	ML105S-03C	5	4.5 - 5.5	270	8	3.3	303	30	74	30	2400	600
▪	ML105S-05C	5	4.5 - 5.5	270	8	5	200	20	82	30	2400	600
	ML105S-09C	5	4.5 - 5.5	241	12	9	111	12	83	30	1000	600
	ML105S-12C	5	4.5 - 5.5	241	12	12	84	9	83	30	560	600
▪	ML105S-15C	5	4.5 - 5.5	241	18	15	67	7	83	30	560	600
	ML105S-24C	5	4.5 - 5.5	241	18	24	42	4	83	30	220	600
	ML112S-03C	12	10.8 - 13.2	102	8	3.3	303	30	76	30	2400	250
▪	ML112S-05C	12	10.8 - 13.2	102	8	5	200	20	82	30	2400	250
	ML112S-09C	12	10.8 - 13.2	101	8	9	111	12	83	30	1000	250
	ML112S-12C	12	10.8 - 13.2	101	8	12	84	9	83	30	560	250
	ML112S-15C	12	10.8 - 13.2	101	8	15	67	7	83	30	560	250
	ML112S-24C	12	10.8 - 13.2	99	8	24	42	4	85	30	220	250
	ML115S-05C	15	13.5 - 16.5	82	8	5	200	20	82	30	2400	200
	ML115S-09C	15	13.5 - 16.5	82	8	9	111	12	82	30	1000	200
	ML115S-15C	15	13.5 - 16.5	81	8	15	67	7	83	30	560	200
	ML124S-03C	24	21.6 - 26.4	53	8	3.3	303	30	76	30	2400	100
▪	ML124S-05C	24	21.6 - 26.4	53	8	5	200	20	80	30	2400	100
	ML124S-09C	24	21.6 - 26.4	51	8	9	111	12	80	30	1000	100
	ML124S-12C	24	21.6 - 26.4	51	8	12	84	9	80	30	560	100
	ML124S-15C	24	21.6 - 26.4	51	8	15	67	7	80	30	560	100
	ML124S-24C	24	21.6 - 26.4	53	8	24	42	4	80	30	220	100
	* ML103S-05C, ML105S-05C, ML105S-15C, ML112S-05C, ML124S-05C have UL/cUL 62368 approval. Contact factory for safety standard status of other models.											

Notes:

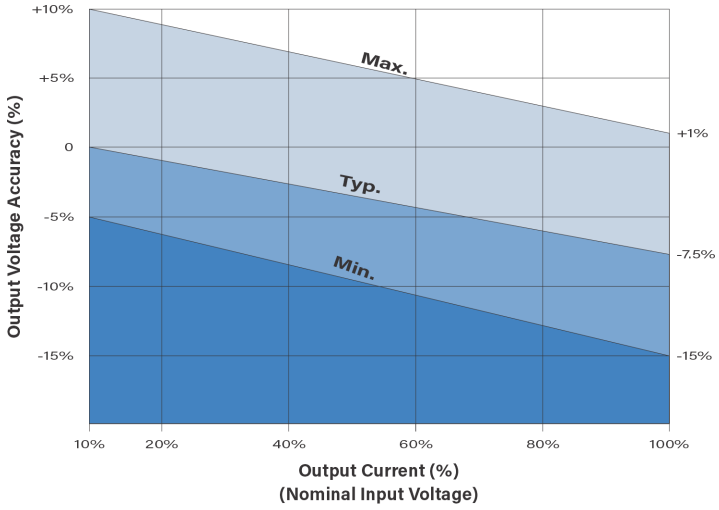
1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
2. The "parallel cable" method is used for ripple and noise test.
3. The maximum capacitive load is tested within the input voltage range and under full load conditions.
4. Unless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

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

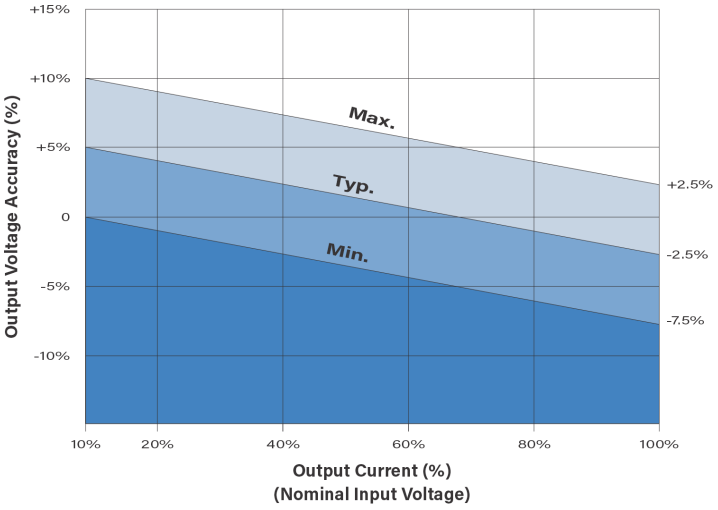
Temperature Derating



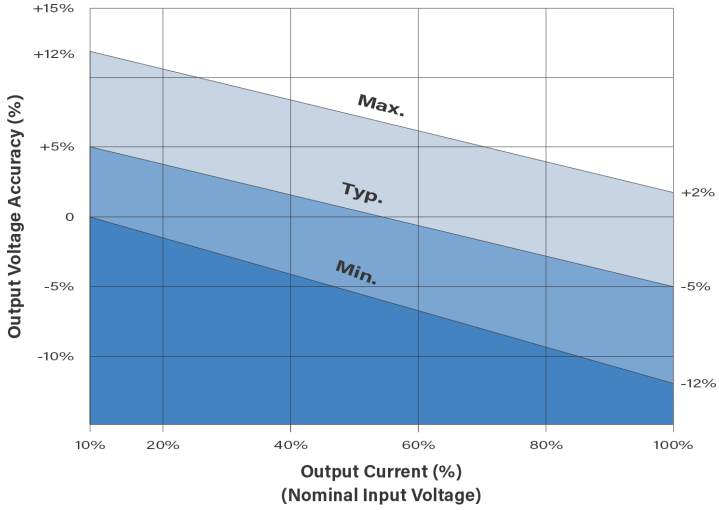
Output Regulation: 3.3V Input, 3.3V Output



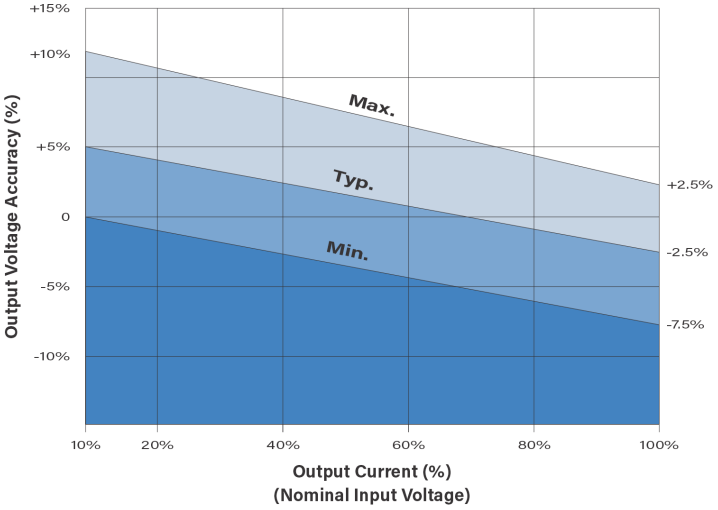
Output Regulation: 3.3V Input, Other Outputs



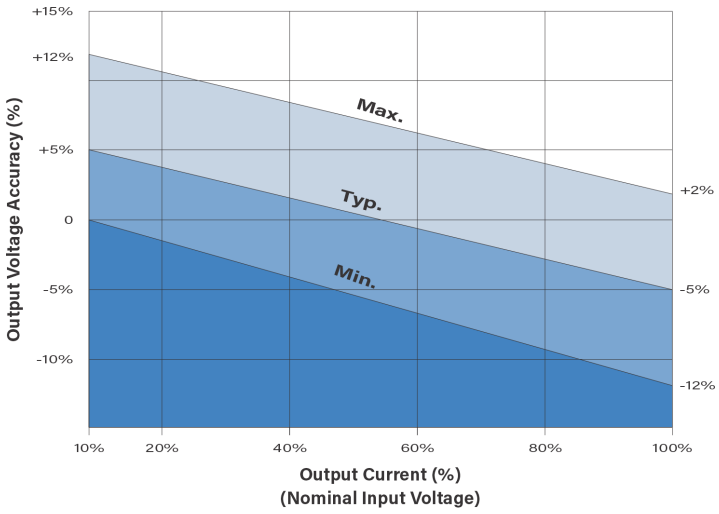
Output Regulation: 5V Input, 3.3V Output



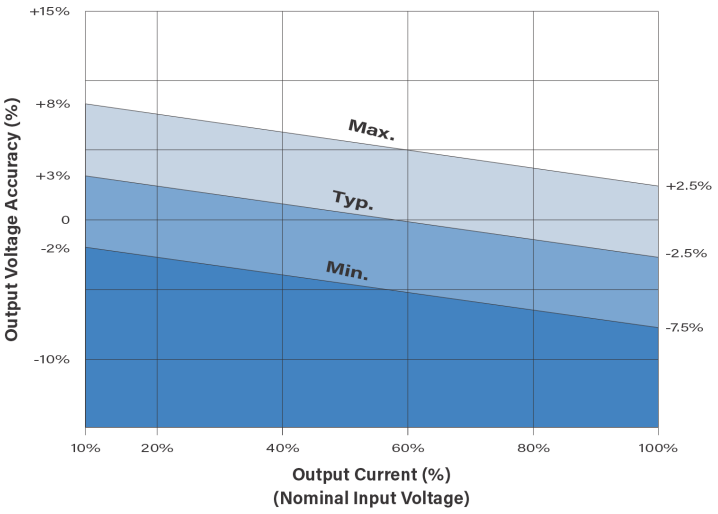
Output Regulation: 5V Input, Other Ouptuts



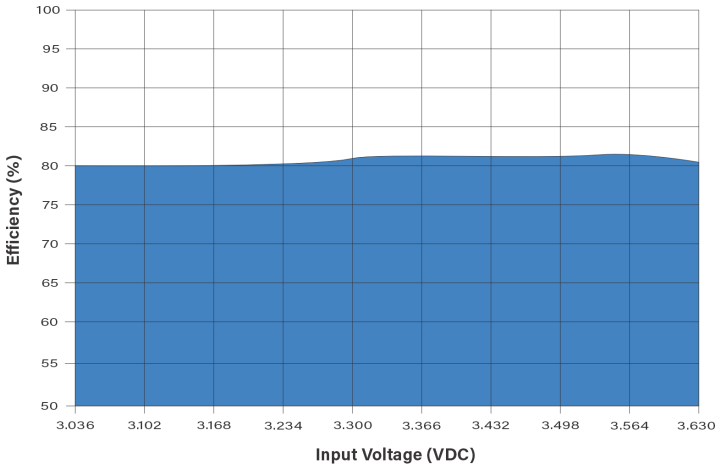
Output Regulation: 12/15/24V Input, 3.3V Output



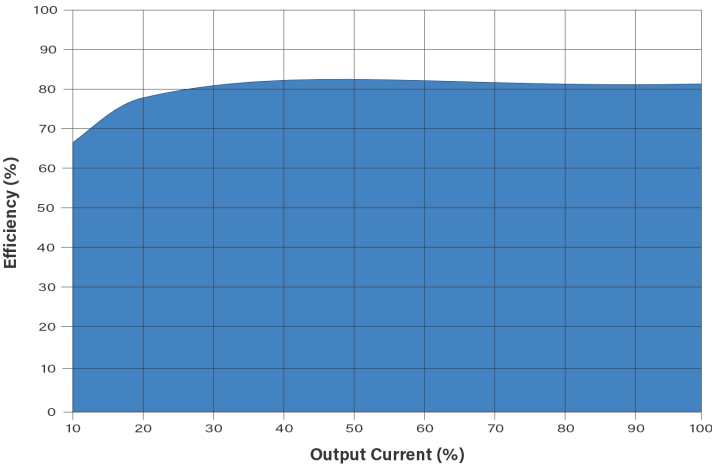
Output Regulation: 12/15/24V Input, Other Ouptuts



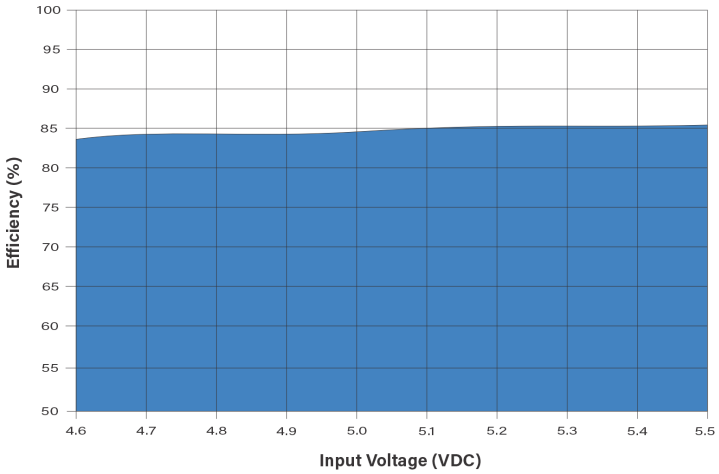
Efficiency vs Input Voltage: ML103S-05C



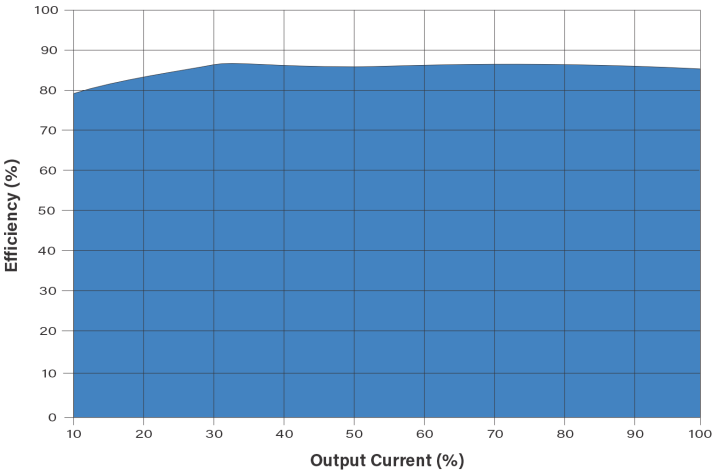
Efficiency vs Output Load: ML103S-05C



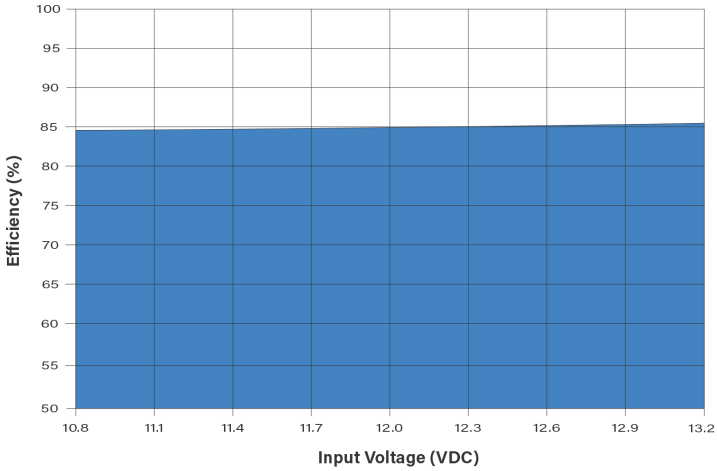
Efficiency vs Input Voltage: ML105S-05C



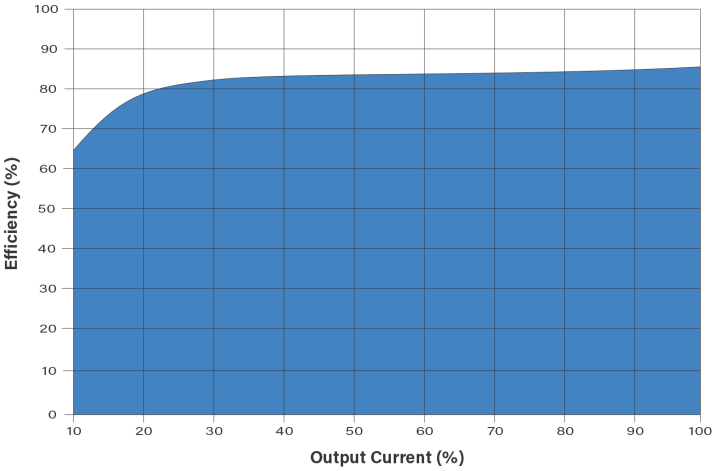
Efficiency vs Output Load: ML105S-05C



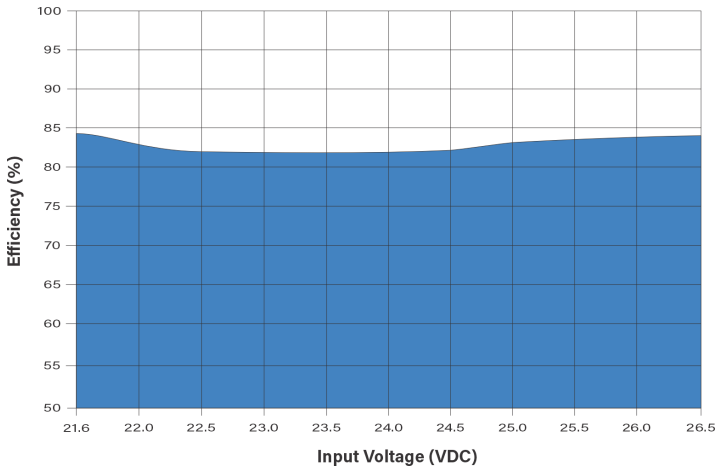
Efficiency vs Input Voltage: ML112S-05C



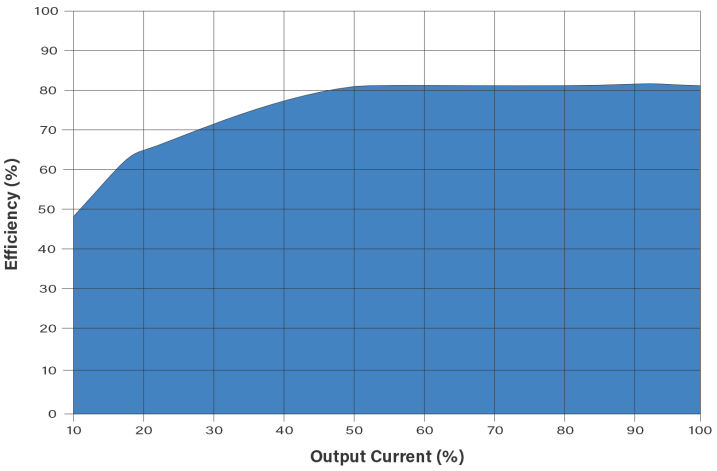
Efficiency vs Output Load: ML112S-05C



Efficiency vs Input Voltage: ML124S-05C



Efficiency vs Output Load: ML124S-05C



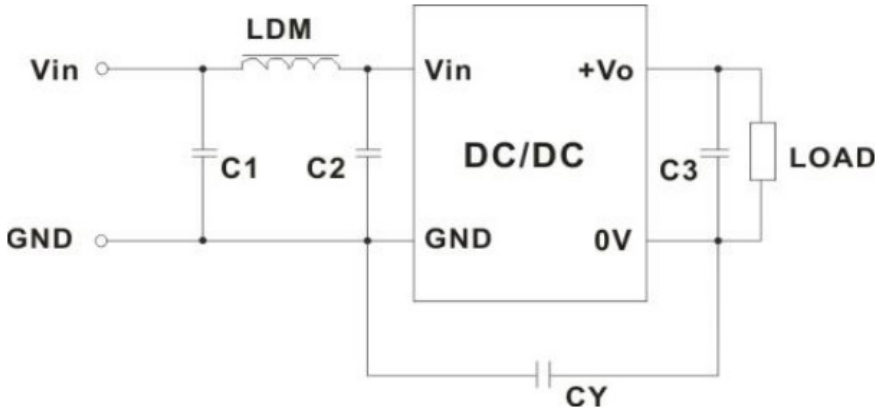
Typical Application Circuit

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

Notes:

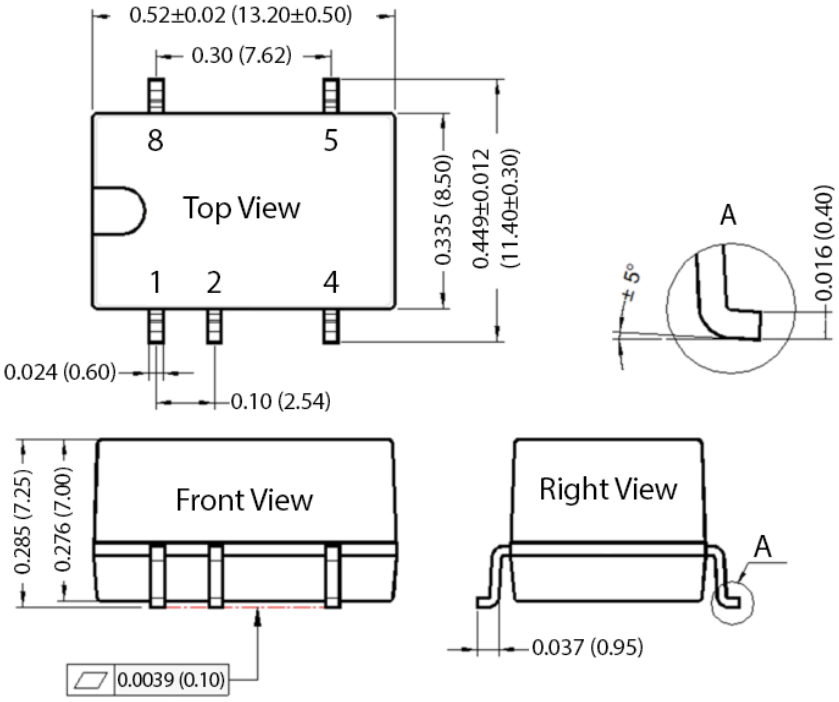
1. To further reduce input and output ripple, a capacitor filtering network can be connected at the input and output terminals. It is important to choose suitable filter capacitor values for smooth operation of the module, particularly to avoid start-up problems caused by capacitor values that are too high. Refer to the table above for recommended input and output capacitor values.

EMC Recommended Circuit

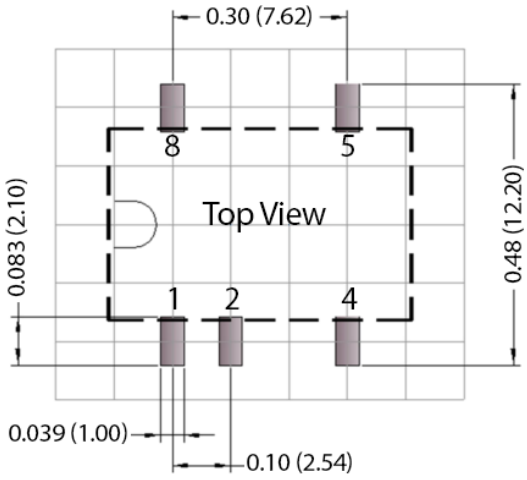


Recommended EMC Values				
Input Voltage	**3.3VDC Input**	**5VDC Input**		**12/15/24VDC Input**
Output Voltage	**-**	**3.3/5/9 VDC**	**12/15/24 VDC**	**-**
C1/C2	4.7uF/16V	4.7uF/25V		4.7uF/50V
CY	270pF/4kV	100pF/4kV	1000pF/4kV	270pF/4kV
C3	Refer to Cout in table above			
LDM	6.8uH			

Mechanical Dimensions



THIRD ANGLE PROJECTION



Note: Grid distance is 2.54 * 2.54 mm

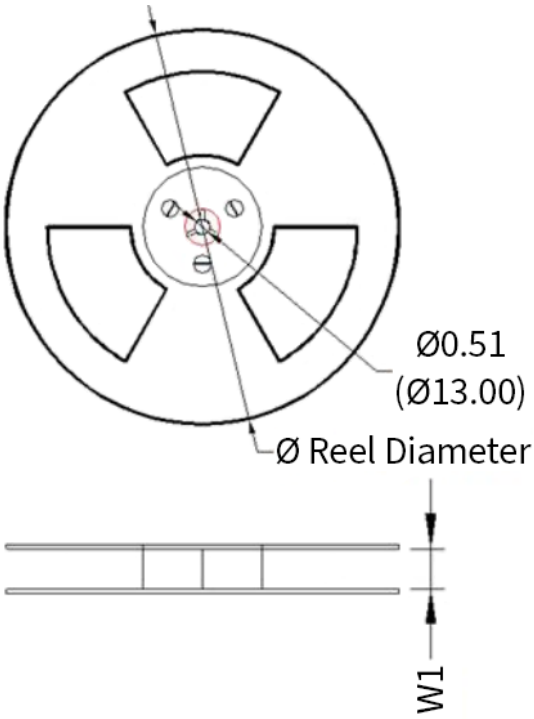
Note:

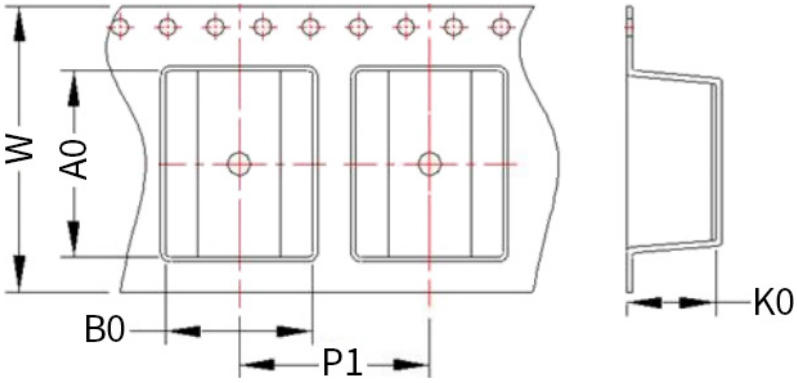
- Unit: inches (mm)
- Pin section tolerances: ±0.004 (±0.10)
- Weight: 0.049 oz (1.4g)
- General tolerances: ±0.010 (±0.25)

Pin	Function
1	GND
2	Vin
4	0V
5	+Vo
8	NC

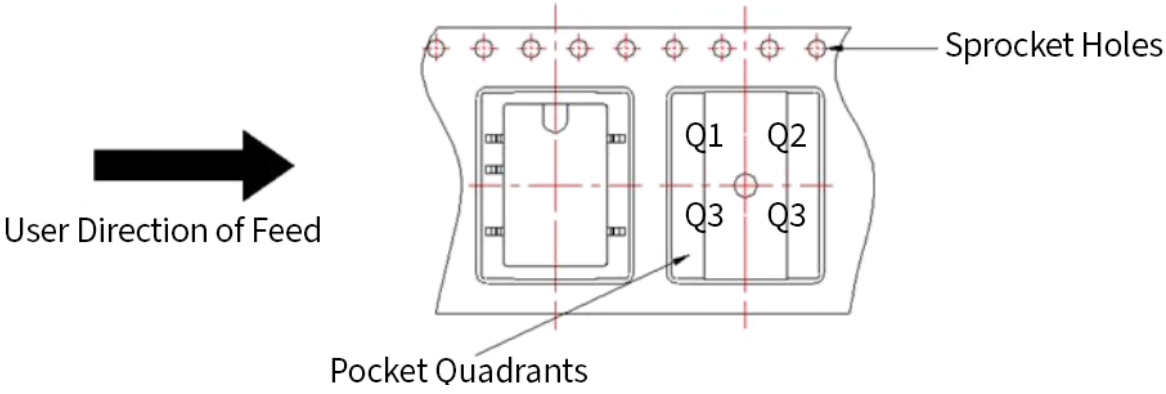
NC: Pin isolated from circuitry

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	5	500	330.0	24.5	13.4	11.7	7.5	16.0	24.0	Q1