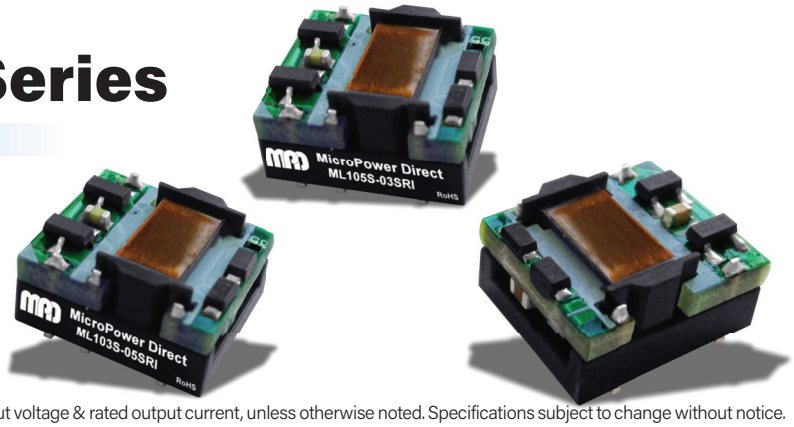
ML100SRI Series

Ultra-Miniature, 1W High Isolation, SMT DC/DC Converters



Key Features:

- 1W Output Power
- Ultra-Miniature SMT Case
- EN 62368 Approved
- 4,200 VDC Isolation
- Single & Dual Outputs
- -40°C to +105°C Operation
- Meets JEDEC J-STD-020D.1
- 7.0 MH MTBF Minimum
- Available on Tape/Reel

Tape & Reel

MicroPower Direct
292 Page Street
Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerdirect.com
W: www.micropowerdirect.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
	5.0 VDC Input	4.50	5.0	5.50	
Input Reflected Ripple Current	See Note 2		20		mA
Start Up Time	See Note 3		20		mS
Input Filter	Capacitor				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	See Tolerance Graphs (Page 3)				
Line Regulation	For VIN Change of 1%			±1.2	%
Load Regulation, See Note 4	3.3 VOUT Models			±15	%
	5.0 VOUT Models			±12	
Ripple & Noise (20 MHz), See Note 5	Single Output Models			150	mV P - P
	Dual Output Models			120	
Temperature Coefficient			±0.03		%/°C
Output Short Circuit, See Note 6	Momentary (0.5 Sec.)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	4,200			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	10 kHz, 1V		25		pF
Switching Frequency, See Note 7			60		kHz

EMI Characteristics

Parameter			Criteria	Level
Radiated Emissions		EN 55032		Class B
Conducted Emissions	See Note 8	EN 55032		Class B
ESD		EN 61000-4-2	A	±6 kV Contact
				±8kV Air
RS		EN 61000-4-3	A	3V/m
EFT	See Note 9	EN 61000-4-4	A	±2 kV
Surge	See Note 9	EN 61000-4-5	A	±2 kV
CS		EN 61000-4-6	A	10 Vrms
PFMF		EN 61000-4-8	A	100 A/m

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient, 80% Load	-40	+25	+105	°C
	Ambient, 100% Load	-40	+25	+100	
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Size	See Mechanical Drawing (Page 5)
Base Material	Non-Conductive Black Plastic (UL94-V0)
Weight	See Mechanical Drawing (Page 5)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	7.0			MHours
Safety Standards	UL/cUL 62368-1 recognition (UL certificate)				
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1		Level 1		
Vibration	MIL STD 810F				

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	3.3 VDC Input			5.0	VDC
	5.0 VDC Input			9.0	
Peak Reflow Temperature	See Note 10			245	°C
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.

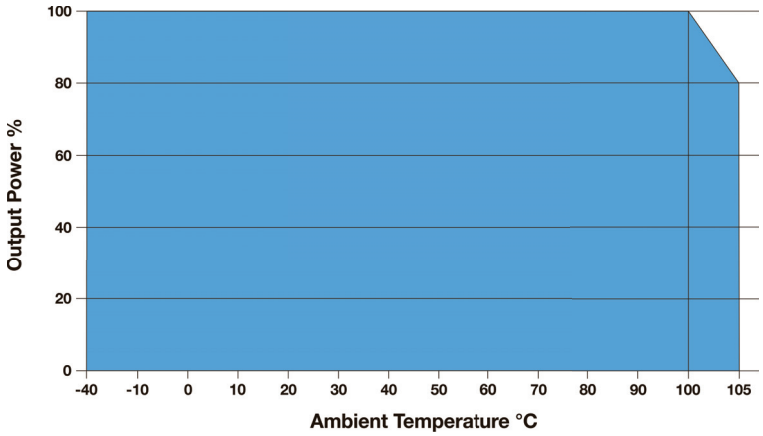
Model Selection Guide

Model Number	Input				Output			Efficiency (%, Typ)	Output Capacitive Load (µF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
ML103S-03SRI(TR)	3.3	2.97 - 3.63	421	50	3.3	303	0.0	73	220	1,000
ML103S-05SRI(TR)	3.3	2.97 - 3.63	410	50	5.0	200	0.0	75	220	1,000
ML103D-03SRI(TR)	3.3	2.97 - 3.63	404	50	±3.3	±151	0.0	75	100	1,000
ML103D-05SRI(TR)	3.3	2.97 - 3.63	394	50	±5.0	±100	0.0	78	100	1,000
ML105S-03SRI(TR)	5.0	4.50 - 5.50	278	40	3.3	303	0.0	73	220	500
ML105S-05SRI(TR)	5.0	4.50 - 5.50	267	40	5.0	200	0.0	76	220	500
ML105D-03SRI(TR)	5.0	4.50 - 5.50	267	40	±3.3	±151	0.0	75	100	500
ML105D-05SRI(TR)	5.0	4.50 - 5.50	260	40	±5.0	±100	0.0	78	100	500

Notes:
1. The specified maximum capacitive load is for each output.
2. Reflected ripple current is measured with a simulated source inductance of 12 µH, and a source capacitance of 47 µF (ESR <1V at 100 kHz).
3. Start up time is measured at nominal input and with a constant resistive load.
4. Load regulation is measured for an output change of 10% to 100%.
5. When measuring output ripple & noise, it is recommended that an external 0.1 µF ceramic capacitor be placed in parallel with a 10 µF electrolytic capacitor from the +VOUT pin to the -VOUT pin for single output units and from each output to ground for dual output models. For noise sensitive applications, the value of these capacitors can be increased, but care must be taken not to exceed the specified capacitive load limit for each output.
6. In the event of a short circuit that is less than 0.5S the unit recovers automatically.
7. Switching frequency for the **ML105S-05SRI** is typically 70 kHz.
8. See the diagram and notes for the "Typical Connection" below.
9. See the diagram and notes for the "Typical Connection" below.
10. The recommended solder reflow settings are a peak temperature of 245 °C for a maximum period (T_{PK}) of 10S and a time above liquidous (T_L) of ≤60 seconds at 217 °C. For more information, please contact the factory.
11. Operation at no-load will not damage these units. However, they may not meet all specifications.
12. It is not recommended that a water wash process be used for board assemblies containing **ML100SRI** units. Contact the factory for more information.
13. It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

For Tape & Reel packaging add "TR" to the model number (**ML103D-05SRITR**). Details on Tape/Reel packaging are on pages 6 & 7.

Derating Curve

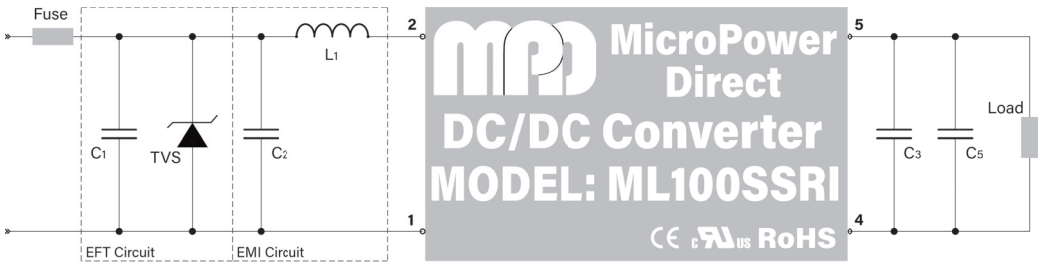


The diagrams at right illustrates a typical connection of the **ML100XSRI** series for applications that require meeting EMC standards. Some notes on this diagram (starting with the input circuit) are:
1. It is recommended that an external fuse be used. The recommended fuse is shown in the model chart above.
2. To meet the surge test requirements of EN 61000-4, the input capacitor (C_1) and TVS are required. Recommended values are given in the table below.
3. To meet EN 55032 class "B" conducted emissions, the input filter components C_2 and L_1 are required. Recommended values are given in the table below.
4. The output filtering capacitors (C_3 to C_6) are used in testing output ripple and noise. Capacitors C_3 & C_4 are high frequency electrolytic's, and capacitors C_5 & C_6 are ceramic. The values used in production are given in the table below. The value of these capacitors may be increased for noise sensitive applications, but care must be taken not to exceed the capacitive load limit of the converter. Voltage derating of capacitors should be 80% or above.
5. Recommended values for components are:

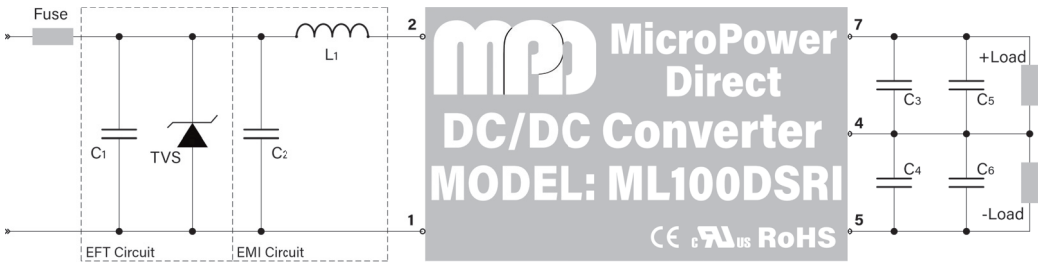
Component	Value
Fuse	See Above
C_1	330 µF/50V
TVS	SMDJ9.0A
C_2	1206, 22 µF/10V
L_1	6.6 µH
C_3, C_4	10 µF
C_5, C_6	0.1 µF

6. Input noise and surge suppression modules are available for a number of **MPD** DC/DC power supplies. For pricing or full technical information on these modules please contact the factory.

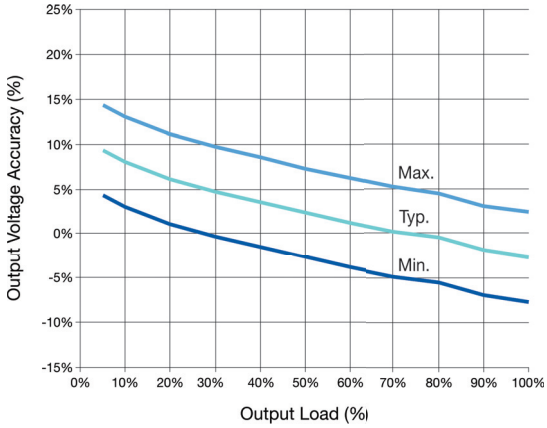
Typical Connection: Single Output



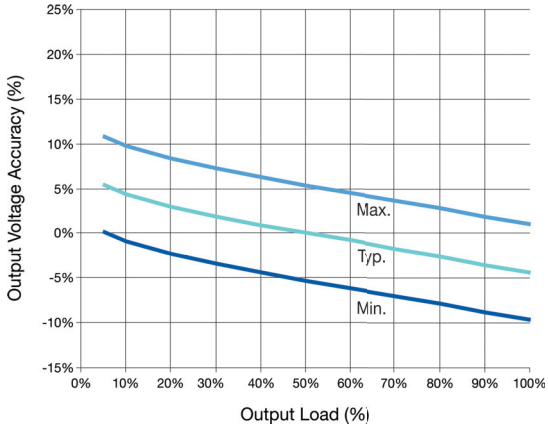
Typical Connection : Dual Output



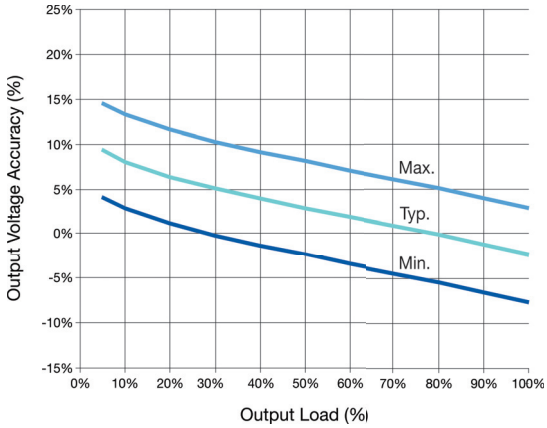
Tolerance Envelope: ML103S-03SRI



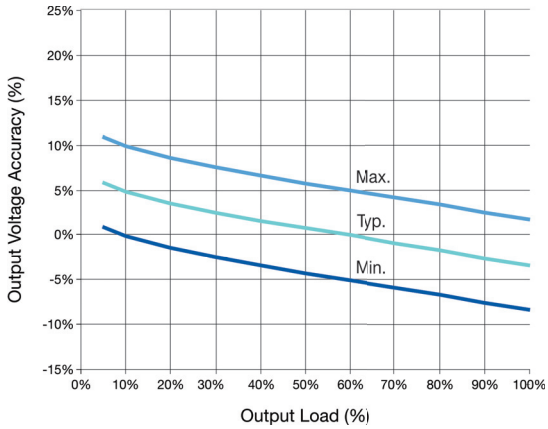
Tolerance Envelope: ML103S-05SRI



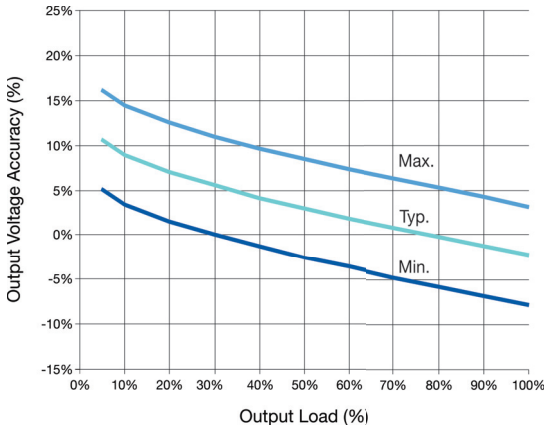
Tolerance Envelope: ML103D-03SRI



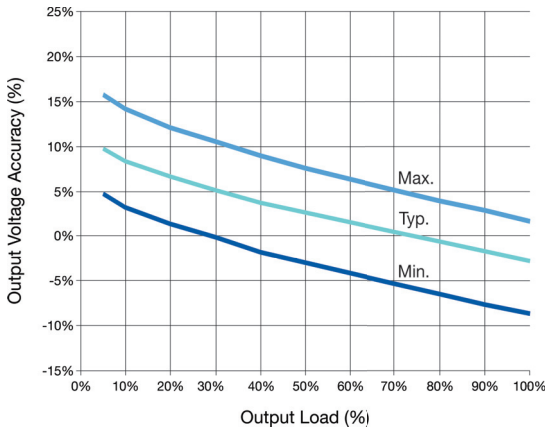
Tolerance Envelope: ML103D-05SRI



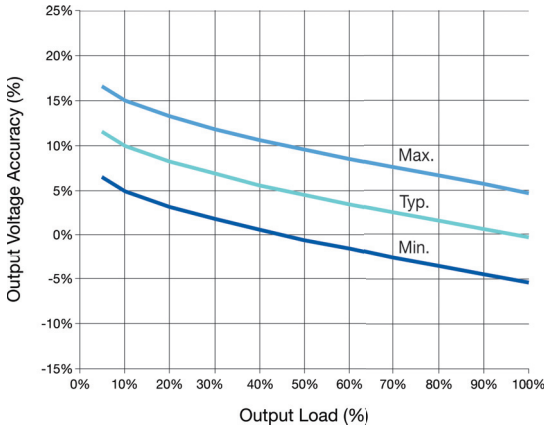
Tolerance Envelope: ML105S-03SRI



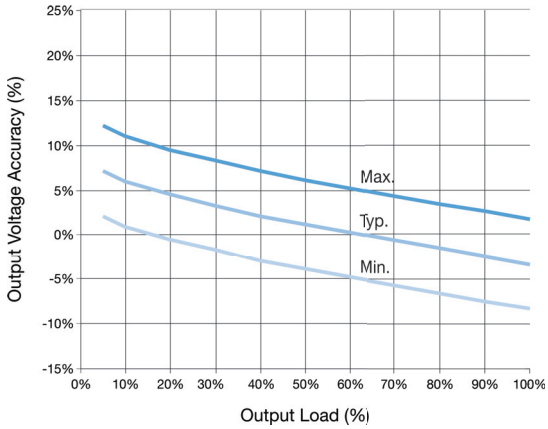
Tolerance Envelope: ML105S-05SRI



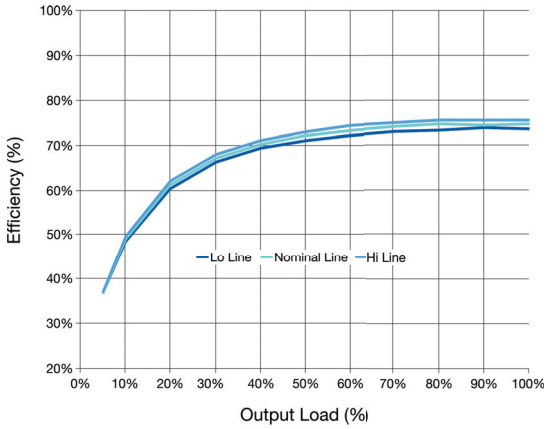
Tolerance Envelope: ML105D-03SRI



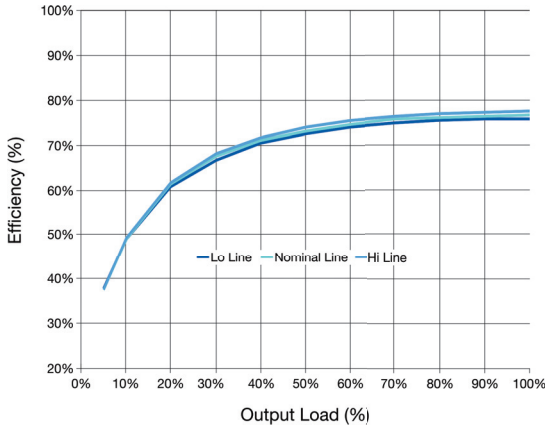
Tolerance Envelope: ML105D-05SRI



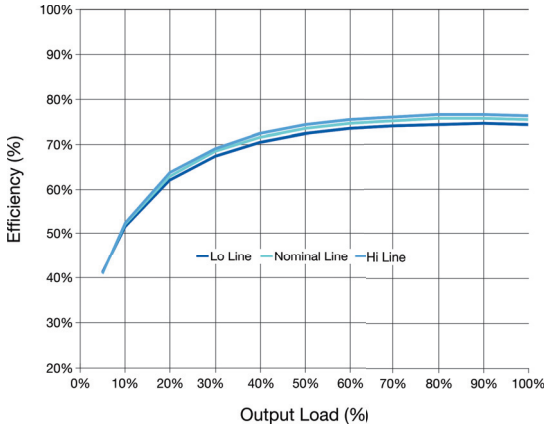
Efficiency vs Load: ML103S-03SRI



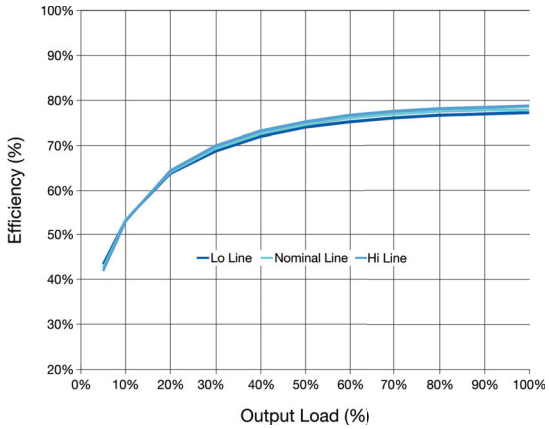
Efficiency vs Load: ML103S-05SRI



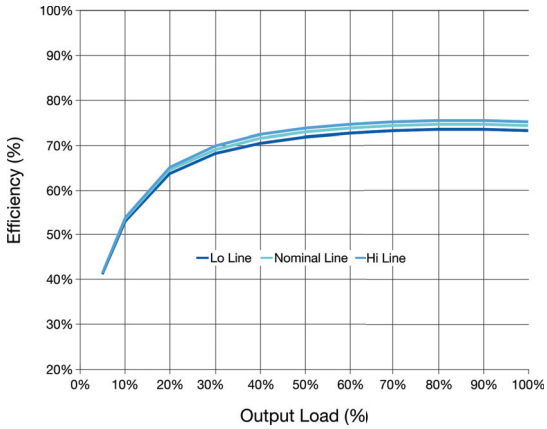
Efficiency vs Load: ML103D-03SRI



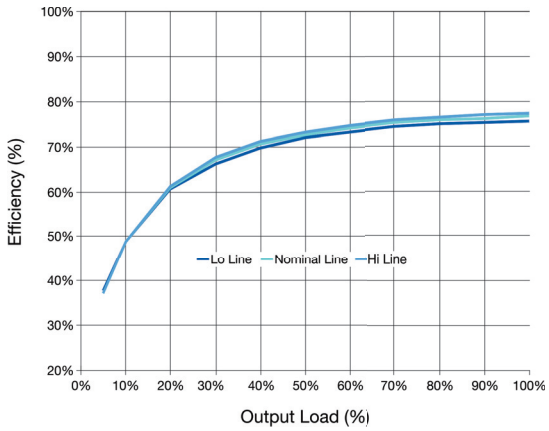
Efficiency vs Load: ML103D-05SRI



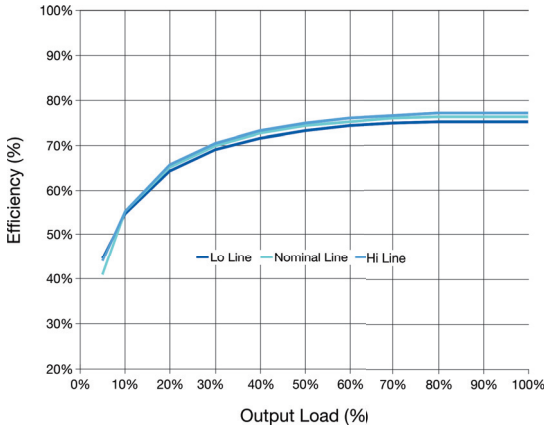
Efficiency vs Load: ML105S-03SRI



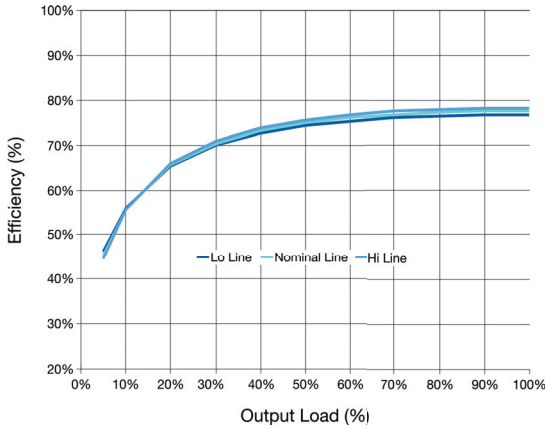
Efficiency vs Load: ML105S-05SRI



Efficiency vs Load: ML105D-03SRI

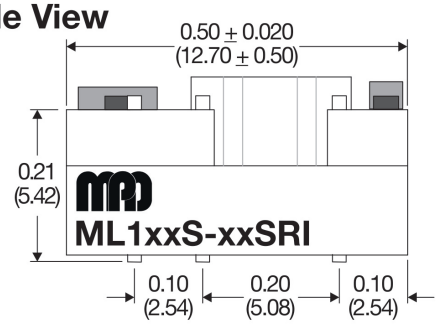


Efficiency vs Load: ML105D-05SRI

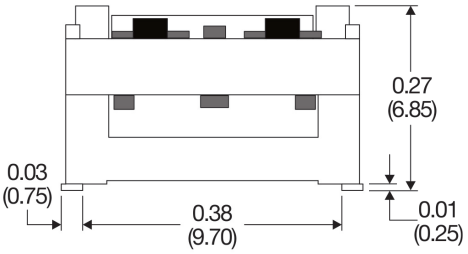


Mechanical Dimensions, Single Output

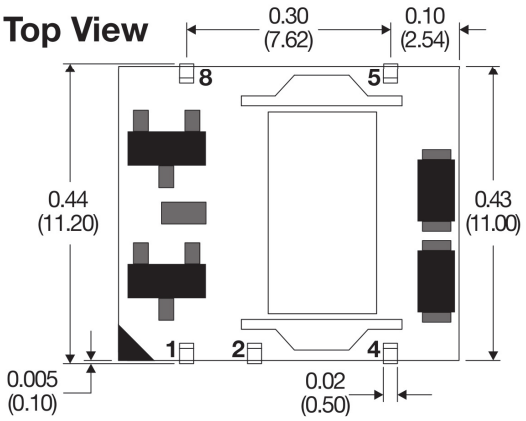
Side View



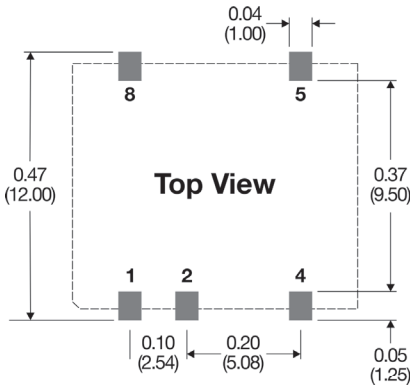
End View



Top View



Board Layout



Pin Connections

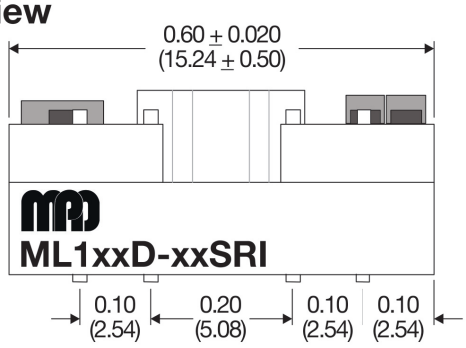
Pin	Description
1	-VIN
2	+VIN
4	-VOUT
5	+VOUT
8	NC

NC = Not for electrical connection

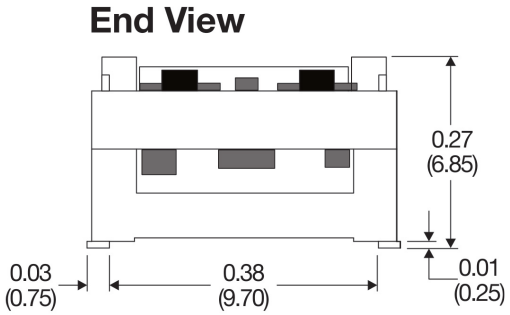
Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Weight = 0.54 Oz (152g)

Mechanical Dimensions, Dual Output

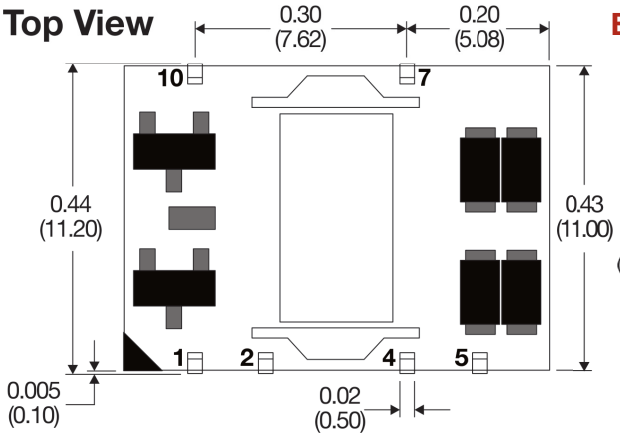
Side View



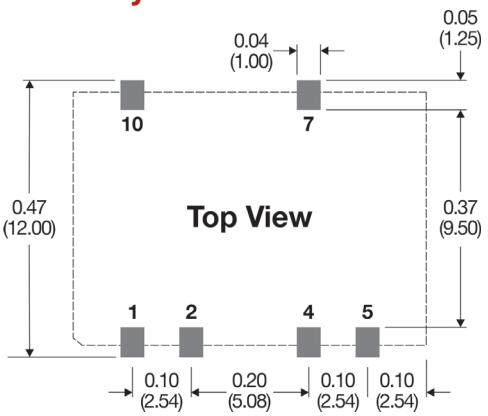
End View



Top View



Board Layout



Pin Connections

Pin	Description
1	-VIN
2	+VIN
4	Common
5	-VOUT
7	+VOUT
10	NC

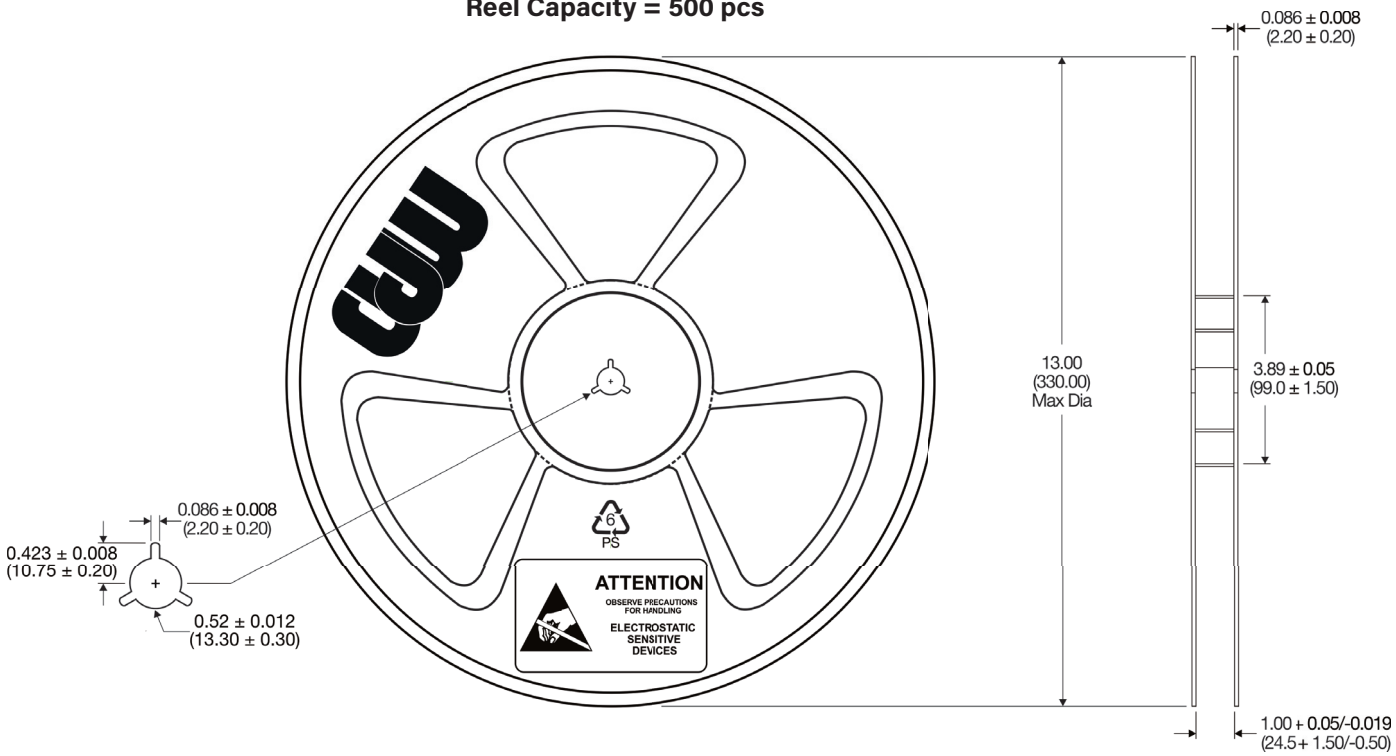
NC = Not for electrical connection

Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Weight = 0.64 Oz (180g)

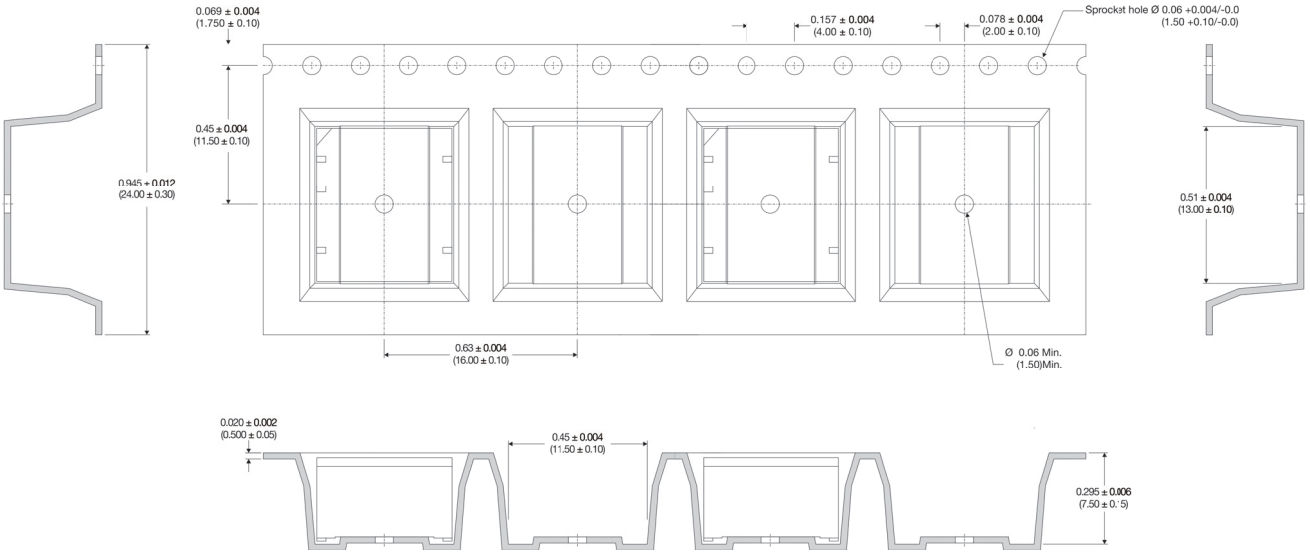
Packaging Specifications, Single Output Models

Reel Dimensions

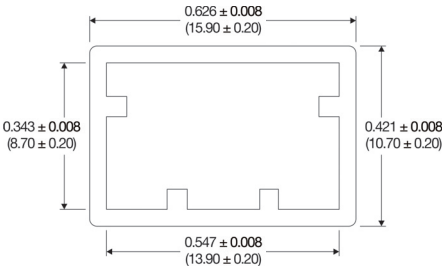
Reel Capacity = 500 pcs



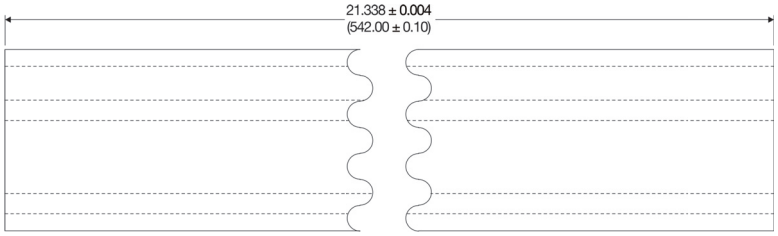
Tape Dimensions



Tube Dimensions

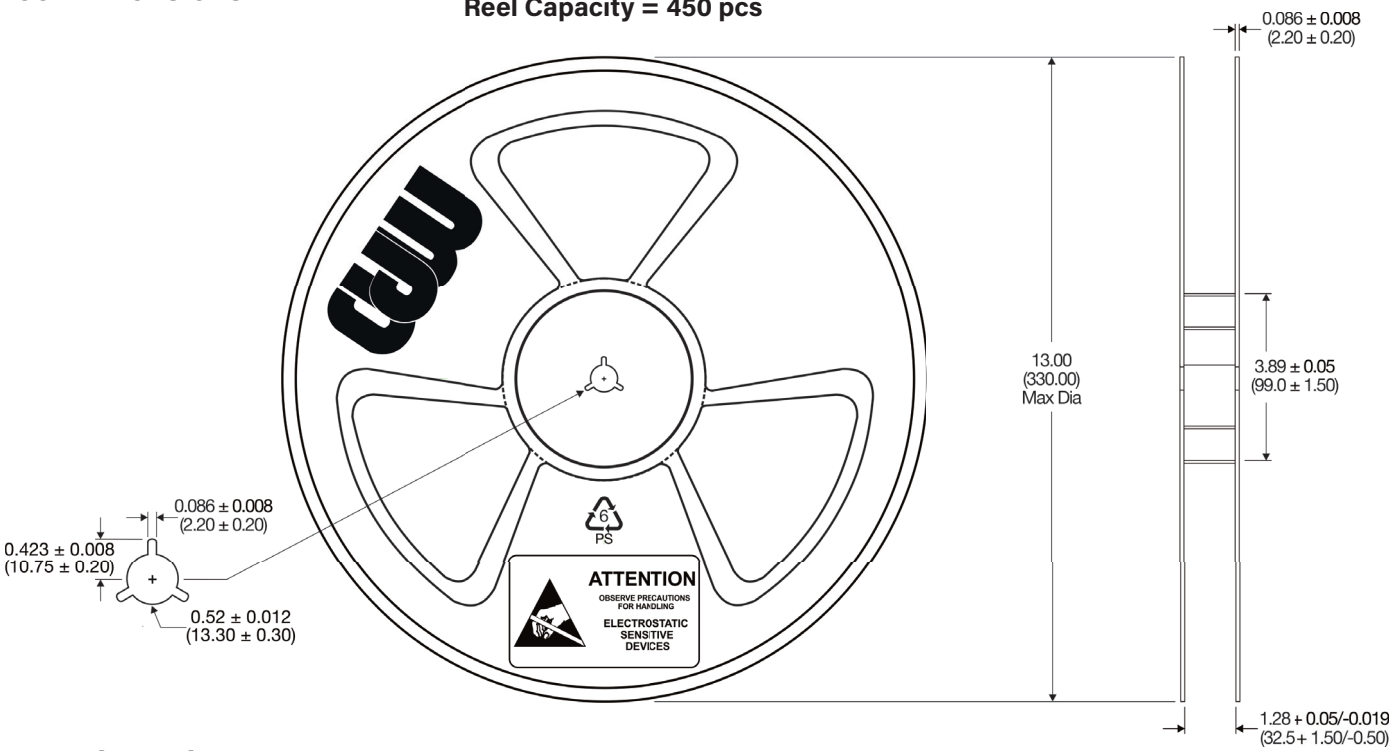


Tube Capacity = 40 pcs

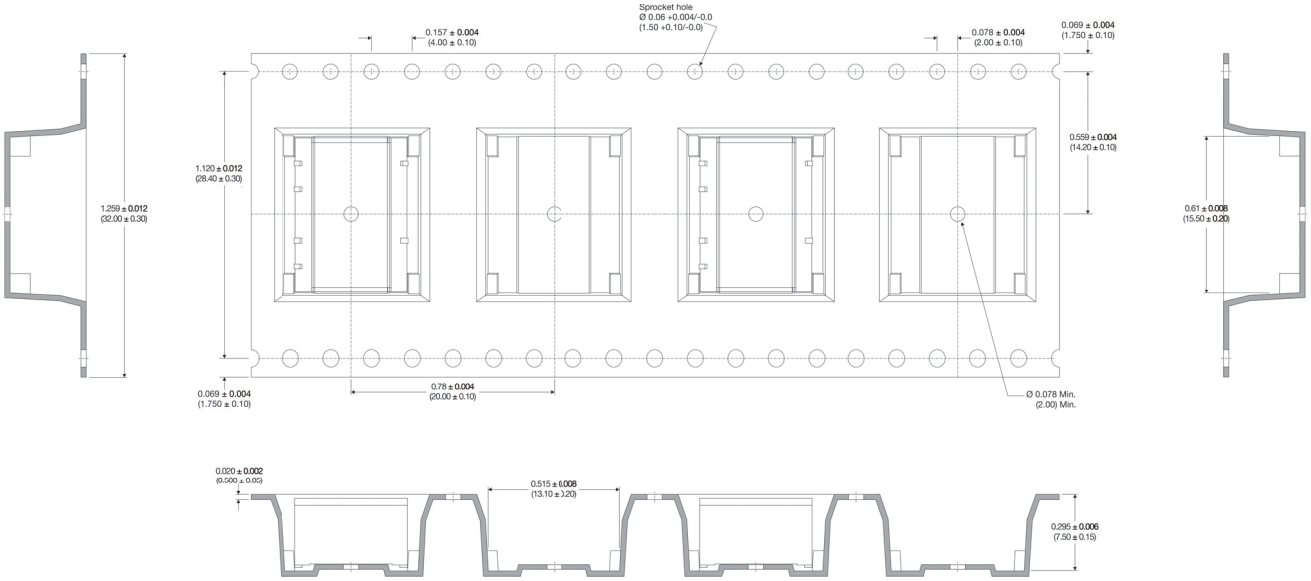


Reel Dimensions

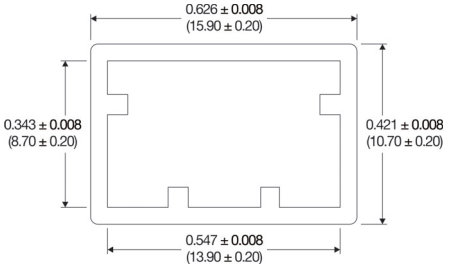
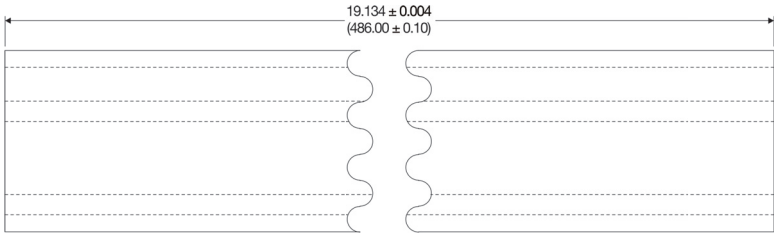
Reel Capacity = 450 pcs



Tape Dimensions



Tube Dimensions



Tube Capacity = 30 pcs