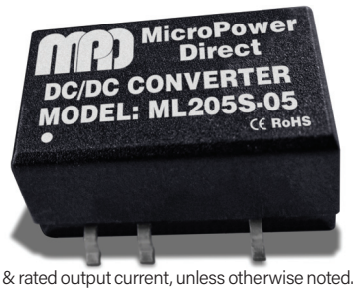
ML200x Series

Ultra-Miniature, 2W Single & Dual SMT DC/DC Converters



Key Features:

- 2W Output Power
- Ultra-Miniature SMT Case
- 1,500 VDC Isolation
- Single And Dual Outputs
- 5V, 12, & 24V Inputs
- -40°C to +85°C Operation
- 16 Standard Models
- 2.0 MH MTBF Minimum
- Available on Tape/Reel

RoHS

Tape & Reel

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	5 VDC Input	4.5	5.0	5.5	VDC
	12 VDC Input	10.8	12.0	13.2	
	24 VDC Input	21.6	24.0	26.4	
Reverse Polarity Input Current				0.3	A
Input Filter	Capacitor				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±5.0		%
Output Voltage Balance	Dual Outputs, Balanced Loads		±0.1	±1.0	%
Line Regulation	For VIN Change of 1%		±1.2	±1.5	%
Load Regulation, See Note 2	See Model Selection Guide				
Ripple & Noise (20 MHz)	See Note 3			120	mV P - P
Temperature Coefficient			±0.01	±0.02	%/°C
Output Short Circuit	Momentary (0.5 Sec.)				

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, 1V		60	100	pF
Switching Frequency		50	100	120	kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Maximum Case Temperature	Case			+90	°C
Storage Temperature Range		-50		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size	See Mechanical Drawings (Page 3)	
Case Material	Non-Conductive Black Plastic (UL94-V0)	
Weight	Single Output Models	0.05 Oz (1.5g)
	Dual Output Models	0.08 Oz (2.2g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	2.0			MHours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1		Level 2		

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	5 VDC Input			9.0	VDC
	12 VDC Input			18.0	
	24 VDC Input			30.0	
Peak Reflow Temperature	See "Reflow Settings Page 2			245	°C
Lead Temperature	1.5 mm From Case For 10 Sec.			300	°C
Internal Power Dissipation	All Models			650	mW

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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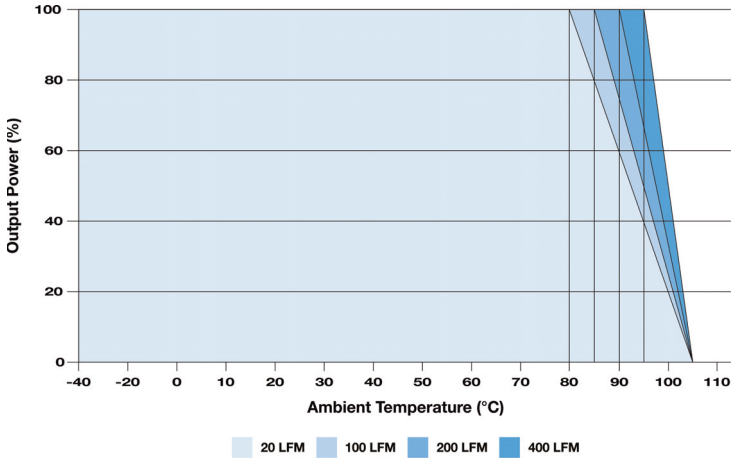
Model Selection Guide

Model Number	Input				Output			Load Regulation (%, Max)	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							
ML205S-03	5	4.50 - 5.50	471	60	3.3	500	10.0	11	73	47	1,000
ML205S-05	5	4.50 - 5.50	548	60	5.0	400	8.0	11	78	47	1,000
ML205S-12	5	4.50 - 5.50	514	60	12.0	165	3.0	11	78	10	1,000
ML205D-05	5	4.50 - 5.50	541	60	±5.0	±200	±4.0	10	74	10	1,000
ML205D-12	5	4.50 - 5.50	524	60	±12.0	±83	±1.5	7	78	4.7	1,000
ML205D-15	5	4.50 - 5.50	521	60	±15.0	±66	±1.0	7	78	4.7	1,000
ML212S-03	12	10.8 - 13.2	191	30	3.3	500	10.0	8	74	47	500
ML212S-05	12	10.8 - 13.2	222	30	5.0	400	8.0	8	76	47	500
ML212S-12	12	10.8 - 13.2	209	30	12.0	165	3.0	5	79	10	500
ML212D-12	12	10.8 - 13.2	208	30	±12.0	±83	±1.5	5	78	4.7	500
ML212D-15	12	10.8 - 13.2	206	30	±15.0	±66	±1.0	5	79	4.7	500
ML224S-03	24	21.6 - 26.4	96	15	3.3	500	10.0	8	72	47	250
ML224S-05	24	21.6 - 26.4	111	15	5.0	400	8.0	8	78	47	250
ML224S-12	24	21.6 - 26.4	105	15	12.0	165	3.0	5	77	10	250
ML224D-12	24	21.6 - 26.4	105	15	±12.0	±83	±1.5	5	78	4.7	250
ML224D-15	24	21.6 - 26.4	104	15	±15.0	±66	±1.0	5	78	4.7	250

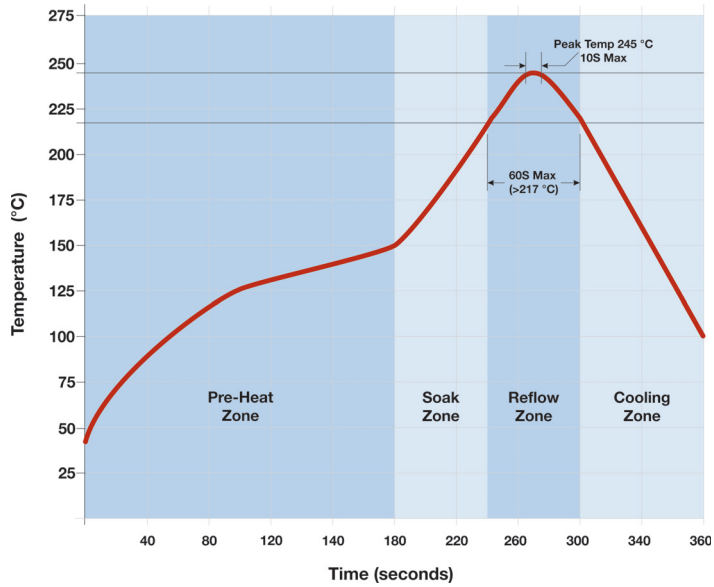
Notes:

1. The specified maximum capacitive load is for each output.
2. Load regulation is measured for an output change of 20% to 100%.
3. When measuring output ripple, it is recommended that an external 0.33 µF ceramic capacitor be placed from each output to the common pin. For noise sensitive applications, the use of 3.3 µF capacitors will reduce the output ripple.
4. Operation at no-load will not damage these units. However, they may not meet all specifications.
5. The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up.
   In this case, it is recommended that a low ESR (ESR <1.0Ω at 100 kHz) capacitor be mounted close to the converter. For 5V input units a 2.2 µF is recommended; a 1.0 µF for 12V input units; and for 24V input models, a 0.47 µF.
6. Dual output units may be connected to provide a 10 VDC, 24 VDC or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
7. 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.

Derating Curve

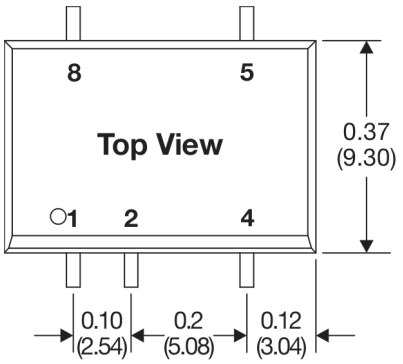


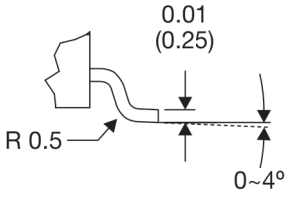
Reflow Solder Settings



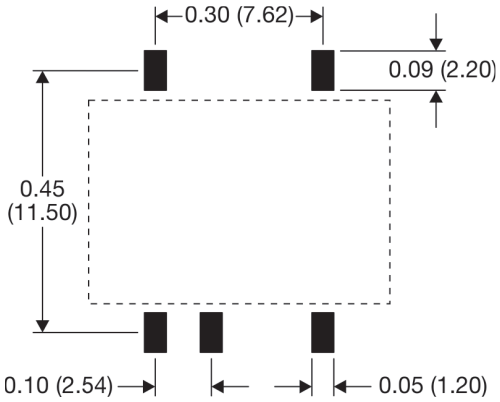
The **ML200x** series is designed to meet the IPC/JEDEC standard J-STD-020D for reflow soldering. The recommended reflow settings are a peak temperature of 245 °C for a maximum period (TPK) of 10S and a time above liquidous (TL) of ≤60 seconds at 217 °C, as illustrated above. For more information, please contact the factory.

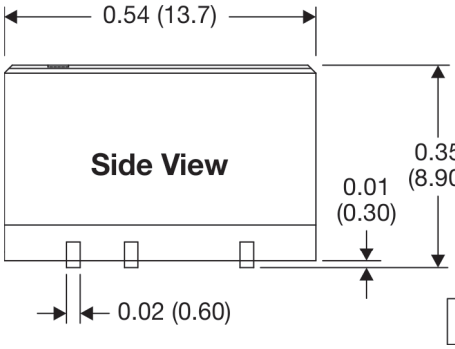
Mechanical Dimensions, Single Output

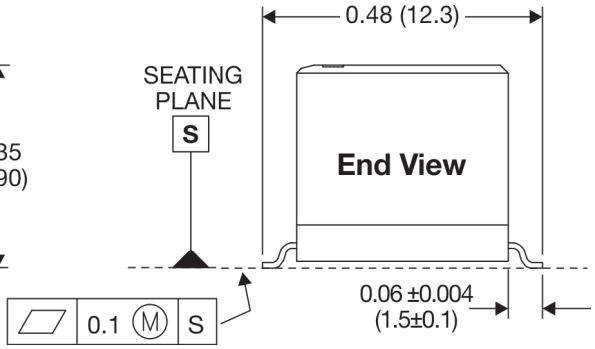




Board Layout







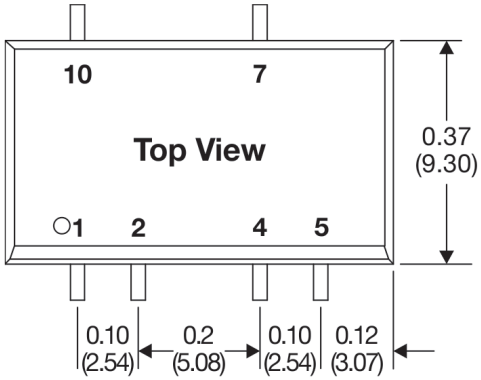
Pin Connections

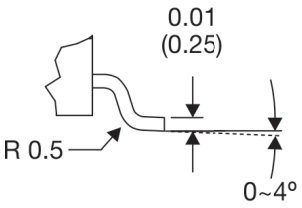
Pin	Description
1	-VIN
2	+VIN
4	-VOUT
5	+VOUT
8	NC

NC = Not for electrical connection

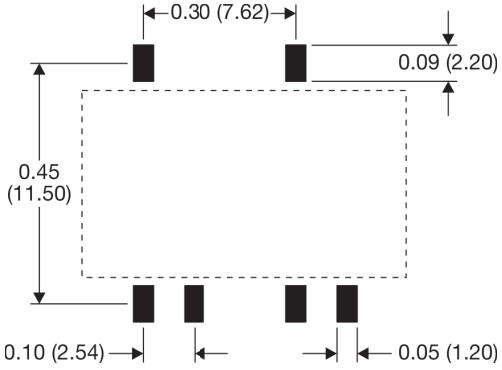
Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Pin 1 is marked by a "dot" or indentation on the unit

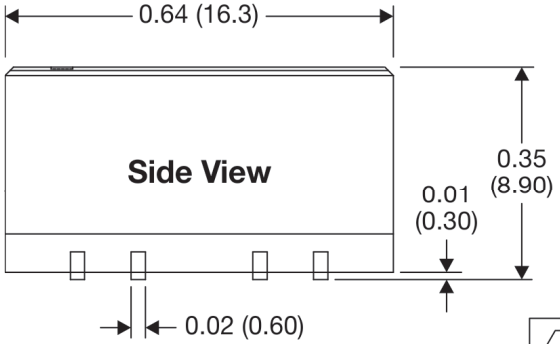
Mechanical Dimensions, Dual Output

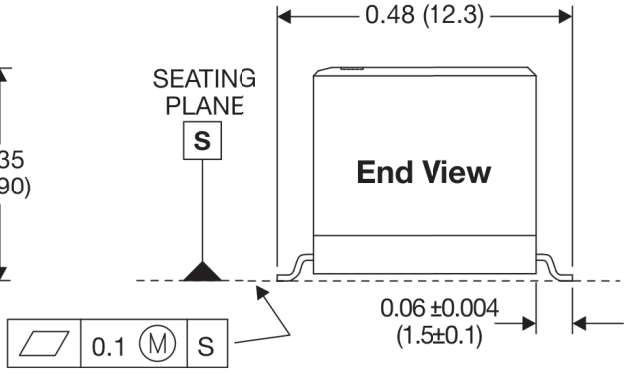




Board Layout







Pin Connections

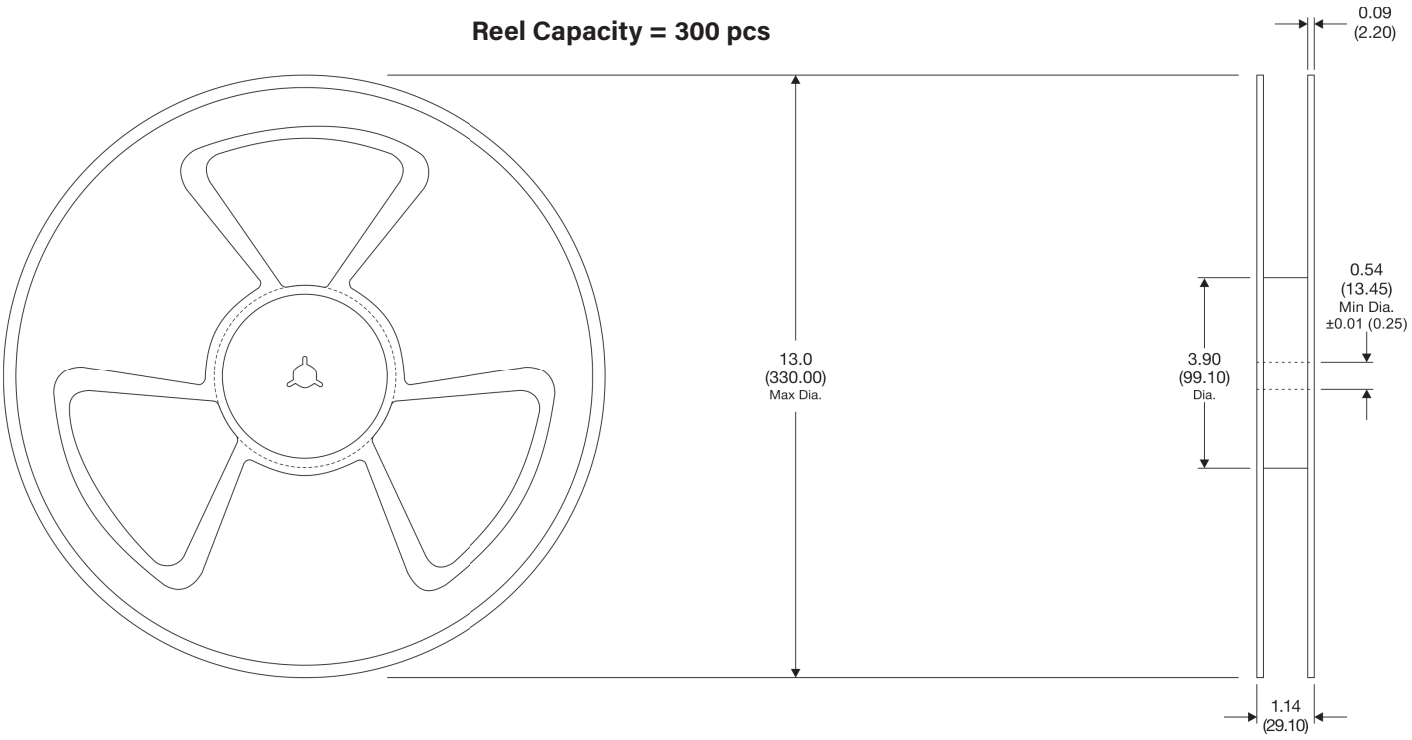
Pin	Description
1	-VIN
2	+VIN
4	Common
5	-VOUT
6	No Pin
7	+VOUT
10	NC

NC = Not for electrical connection

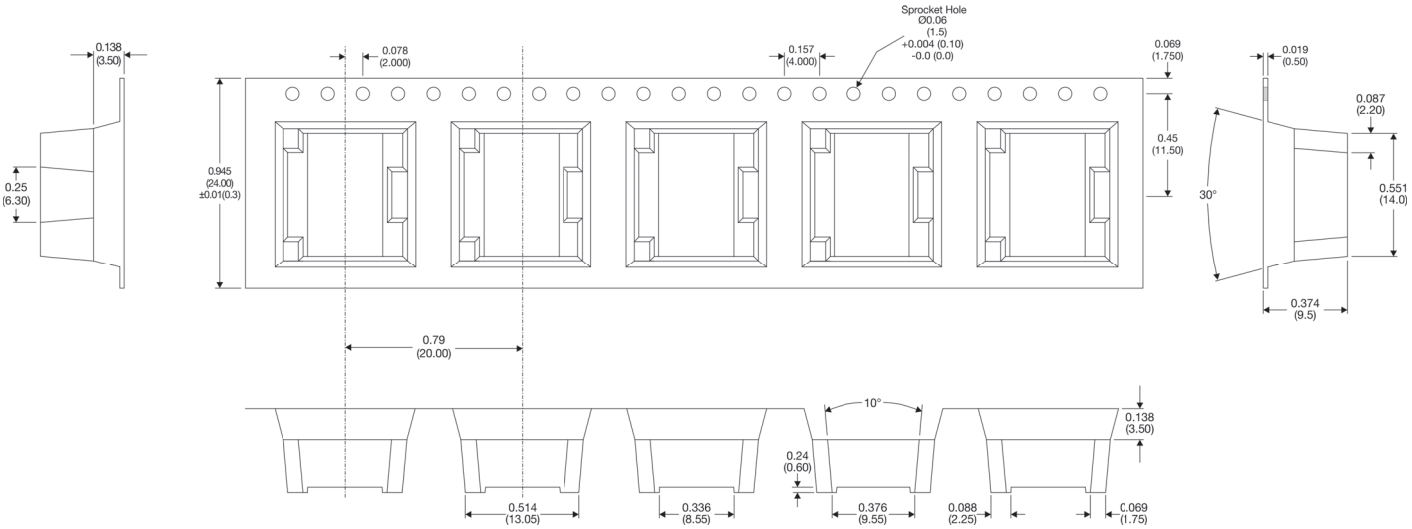
Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Pin 1 is marked by a "dot" or indentation on the unit

Reel Dimensions

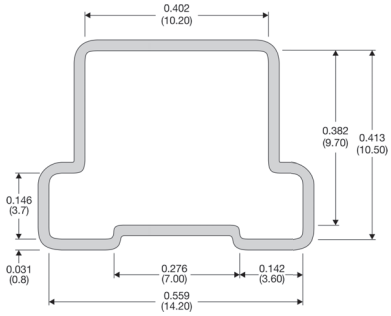
Reel Capacity = 300 pcs



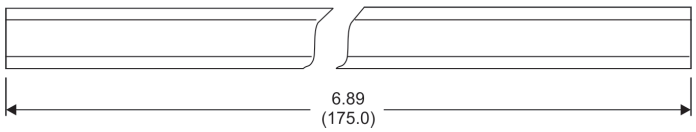
Tape Dimensions



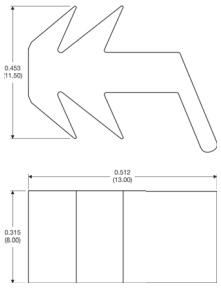
Tube Dimensions



Tube Capacity = 10 pcs



Tube Plug



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