





## Features

- Surface mount packaging for automated assembly
- Small footprint size (1210) and low profile for space-constrained mobile applications
- Ultra-low resistance
- RoHS compliant\* and halogen free\*\*
- Agency recognition:  

## Applications

- Thermal protection for Li-ion and polymer battery packs
- Game consoles
- PC motherboards
- USB port protection - USB 2.0, 3.0 & OTG
- Mobile phones
- Digital cameras

## MF-USML Series - Low Ohmic PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Resistance		Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23 °C		Ohms at 23 °C		Amperes at 23 °C	Seconds at 23 °C	Watts at 23 °C
			Hold	Trip	R <sub>Min.</sub>	R <sub>1Max.</sub>			Typ.
MF-USML175	6	50	1.75	3.50	0.0060	0.0400	8.00	2.50	0.8
MF-USML190	6	50	1.90	4.90	0.0060	0.0300	9.50	3.00	0.8
MF-USML200	6	50	2.00	4.00	0.0050	0.0300	8.00	3.00	0.8
MF-USML230	6	50	2.30	4.60	0.0045	0.0240	8.00	3.50	0.8
MF-USML250	6	50	2.50	5.00	0.0045	0.0220	8.00	3.50	0.8
MF-USML270	6	50	2.70	5.40	0.0040	0.0200	8.00	4.00	0.8
MF-USML300	6	50	3.00	6.00	0.0040	0.0180	8.00	4.00	0.8
MF-USML350	6	50	3.50	7.00	0.0030	0.0180	17.50	2.00	0.8
MF-USML380	6	50	3.80	8.00	0.0020	0.0160	19.00	2.00	0.8
MF-USML400	6	50	4.00	8.00	0.0015	0.0155	20.00	2.00	0.8
MF-USML450	6	50	4.50	9.00	0.0010	0.0150	22.50	2.00	0.8
MF-USML500	6	50	5.00	10.00	0.0010	0.0145	25.00	2.00	0.8
MF-USML600	6	50	6.00	12.00	0.0010	0.0140	30.00	2.00	0.8
MF-USML650	6	50	6.50	13.00	0.0010	0.0140	32.50	2.00	0.8
MF-USML700	6	50	7.00	14.00	0.0010	0.0135	35.00	2.00	0.8

### Environmental Characteristics

Operating Temperature.....	-40 °C to +85 °C	
Passive Aging .....	+85 °C, 1000 hours.....	±10 % typical resistance change
Humidity Aging.....	+85 °C, 85 % R.H. 100 hours .....	±15 % typical resistance change
Thermal Shock .....	+85 °C to -40 °C, 20 times.....	±30 % typical resistance change
Solvent Resistance.....	MIL-STD-202, Method 215 .....	No change
Vibration .....	MIL-STD-883C, Method 2007.1,.....	No change
	Condition A	
Moisture Sensitivity Level (MSL) .....	Level 1	
ESD Classification - HBM.....	Class 6	

### Test Procedures And Requirements For Model MF-USML Series

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech. ....	Verify dimensions and materials .....	Per MF physical description
Resistance.....	In still air @ 23 °C .....	R <sub>min</sub> ≤ R ≤ R <sub>1max</sub>
Time to Trip.....	At specified current, V <sub>max</sub> , 23 °C.....	T ≤ max. time to trip (seconds)
Hold Current .....	30 min. at I <sub>hold</sub> .....	No trip
Trip Cycle Life.....	V <sub>max</sub> , I <sub>max</sub> , 100 cycles.....	No arcing or burning
Trip Endurance .....	V <sub>max</sub> , 48 hours.....	No arcing or burning
Solderability .....	ANSI/J-STD-002 .....	95 % min. coverage

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TÜV Certificate Number ..... R 50302873  
<http://www.tuvdotcom.com/> Follow link to "other certificates", enter File No. 50302873, or [click here](#)



**WARNING Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

\* RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

\*\*Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (Cl) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (Cl) content is 1500 ppm or less.

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# MF-USML Series - Low Ohmic PTC Resettable Fuses

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## Product Dimensions

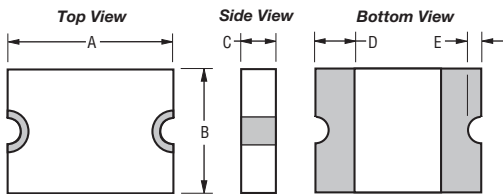
Model	A		B		C		D	E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.
MF-USML175	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.30 (0.012)	0.60 (0.024)	0.25 (0.010)	0.05 (0.002)	0.45 (0.018)
MF-USML190									
MF-USML200									
MF-USML230									
MF-USML250									
MF-USML270									
MF-USML300									
MF-USML350	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.60 (0.024)	1.20 (0.047)	0.25 (0.010)	0.05 (0.002)	0.45 (0.018)
MF-USML380									
MF-USML400									
MF-USML450									
MF-USML500									
MF-USML600									
MF-USML650									
MF-USML700									

Packaging:

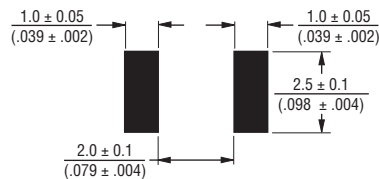
MF-USML175~MF-USML400 = 5000 pcs. per reel

MF-USML450~MF-USML700 = 3500 pcs. per reel

DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$



Recommended Pad Layout



### Terminal material:

ENIG-plated terminals  
(Tin-plated terminals available upon request).

### Termination pad solderability:

Meets ANSI/J-STD-002 Category 2.

### Recommended Storage:

40 °C max./70 % RH max.

## Thermal Derating Chart - I<sub>hold</sub> (Amps)

Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
MF-USML175	2.57	2.33	2.07	1.75	1.49	1.34	1.24	1.00	0.91
MF-USML190	2.89	2.58	2.25	1.90	1.54	1.36	1.21	0.94	0.77
MF-USML200	3.26	2.87	2.50	2.00	1.70	1.48	1.29	1.09	0.78
MF-USML230	3.55	3.17	2.78	2.30	1.94	1.72	1.55	1.27	1.06
MF-USML250	3.70	3.35	2.95	2.50	2.10	1.90	1.75	1.40	1.30
MF-USML270	3.98	3.60	3.18	2.70	2.28	2.03	1.90	1.52	1.40
MF-USML300	4.41	3.99	3.54	3.00	2.55	2.30	2.13	1.71	1.56
MF-USML350	5.00	4.60	4.05	3.50	2.80	2.40	2.00	1.60	1.00
MF-USML380	6.00	5.28	4.52	3.80	3.15	2.65	2.39	2.09	1.60
MF-USML400	5.71	5.26	4.63	4.00	3.20	2.70	2.29	2.00	1.37
MF-USML450	6.62	5.99	5.31	4.50	3.83	3.50	3.20	2.57	2.34
MF-USML500	7.35	6.60	5.90	5.00	4.25	3.88	3.55	2.85	2.60
MF-USML600	8.82	7.98	7.08	6.00	5.10	4.66	4.26	3.43	3.12
MF-USML650	9.56	8.65	7.67	6.50	5.53	5.05	4.62	3.71	3.38
MF-USML700	10.29	9.31	8.26	7.00	5.96	5.44	4.97	3.99	3.64

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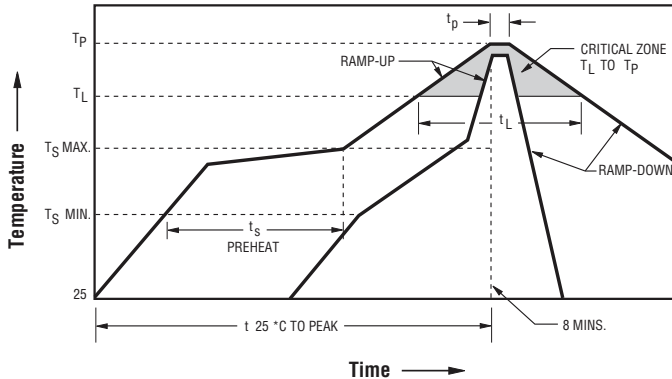
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# MF-USML Series - Low Ohmic PTC Resettable Fuses

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## Solder Reflow Recommendations



### Notes:

- MF-USML models cannot be wave soldered or hand soldered. Please contact Bourns for soldering recommendations.
- All temperatures refer to topside of the package, measured on the package body surface.
- If reflow temperatures exceed the recommended profile, devices may not meet the published specifications.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit, especially during hand soldering. Please refer to the Multifuse® Polymer PTC Soldering Recommendation guidelines.
- Designed for single solder reflow operations.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{Smax}$ to $T_p$ )	3 °C / second max.
PREHEAT: Temperature Min. ( $T_{Smin}$ ) Temperature Max. ( $T_{Smax}$ ) Time ( $t_{Smin}$ to $t_{Smax}$ )	150 °C 200 °C 60~180 seconds
TIME MAINTAINED ABOVE: Temperature ( $T_L$ ) Time ( $t_L$ )	217 °C 60~150 seconds
Peak / Classification Temperature ( $T_p$ )	260 °C
Time within 5 °C of Actual Peak Temperature ( $t_p$ )	20~40 seconds
Ramp-Down Rate	6 °C / second max.
Time within 25 °C to Peak Temperature	8 minutes max.

## How to Order

**MF - USML 175 - 2**

Multifuse® Product Designator  
Series  
USML = 1210 Low-Ohmic Surface Mount Component  
Hold Current, Ihold  
175 - 700 (1.75 - 7.00 Amps)  
Packaging  
Packaged per EIA 481-1  
-2 = Tape and Reel

## Typical Part Marking

Represents total content. Layout may vary.



PART IDENTIFICATION:  
MF-USML175 = U17  
MF-USML190 = U19  
MF-USML200 = U20  
MF-USML230 = U23  
MF-USML250 = U25  
MF-USML270 = U27  
MF-USML300 = U30  
MF-USML350 = U35  
MF-USML380 = U38  
MF-USML400 = U40  
MF-USML450 = U45  
MF-USML500 = U50  
MF-USML600 = U60  
MF-USML650 = U65  
MF-USML700 = U70

MANUFACTURING DATE CODE IS LOCATED ON PACKING LABEL.

**BOURNS®**

### Asia-Pacific:

Tel: +886-2 2562-4117  
Email: asiacus@bourns.com

### Europe:

Tel: +36 88 520 390  
Email: eurocus@bourns.com

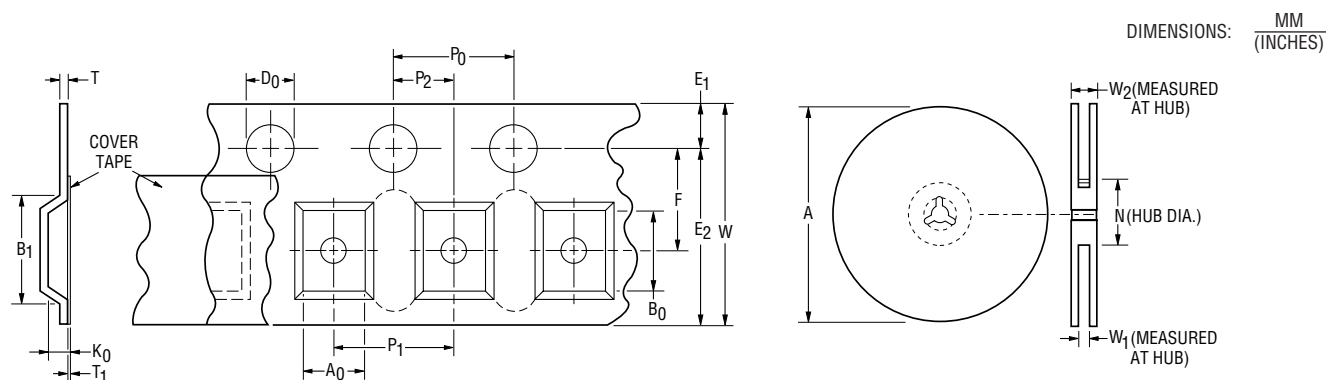
### The Americas:

Tel: +1-951 781-5500  
Email: americus@bourns.com  
[www.bourns.com](http://www.bourns.com)

# MF-USML Series - Low Ohmic PTC Resettable Fuses

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Tape Dimensions	MF-USML Series per EIA 481-2
W	$12.0 \pm 0.3$ (0.472 ± 0.012)
P <sub>0</sub>	$4.0 \pm 0.1$ (0.157 ± 0.004)
P <sub>1</sub>	$4.0 \pm 0.1$ (0.157 ± 0.004)
P <sub>2</sub>	$2.0 \pm 0.05$ (0.079 ± 0.002)
A <sub>0</sub>	$2.9 \pm 0.10$ (0.114 ± 0.004)
B <sub>0</sub>	$3.50 \pm 0.10$ (0.138 ± 0.004)
B <sub>1</sub> max.	$4.5$ (0.177)
D <sub>0</sub>	$1.5 + 0.1/-0.0$ (0.059 + 0.004/-0)
F	$5.5 \pm 0.05$ (0.216 ± 0.002)
E <sub>1</sub>	$1.75 \pm 0.10$ (0.069 ± 0.004)
E <sub>2</sub> typ.	$10.25$ (0.404)
T max.	$0.6$ (0.024)
T <sub>1</sub> max.	$0.1$ (0.004)
K <sub>0</sub> (MF-USML175~MF-USML400)	$0.65 \pm 0.10$ (0.026 ± 0.004)
K <sub>0</sub> (MF-USML450~MF-USML700)	$1.10 \pm 0.10$ (0.043 ± 0.004)
Leader min.	$390$ (15.35)
Trailer min.	$160$ (6.30)
<b>Reel Dimensions</b>	
A max.	$185$ (7.283)
N min.	$50$ (1.97)
W <sub>1</sub>	$12.4 + 1/-0$ (0.488 + 0.039/-0)
W <sub>2</sub> max.	$15.4$ (0.606)



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