

# Type MLS 125 °C Flatpack, Ultra Long Life, Aluminum Electrolytic

## Rugged Stainless-Steel Case



The Type MLS extends the super performance of the MLP from a maximum operating temperature of 85 °C to 125 °C. While the MLP is inherently capable of operation at 125 °C, its flat aluminum case can't withstand the higher temperature without inflating from internal pressure. The MLS incorporates a rugged, stainless steel case which assures flatness to beyond 125 °C. The MLS is perfect for hi-rel military systems and applications operating above 85 °C.

### Highlights

- Near-hermetic welded seal
- Stainless-steel case
- 100 years expected operating life
- Withstands more than 80,000 feet altitude

### Specifications

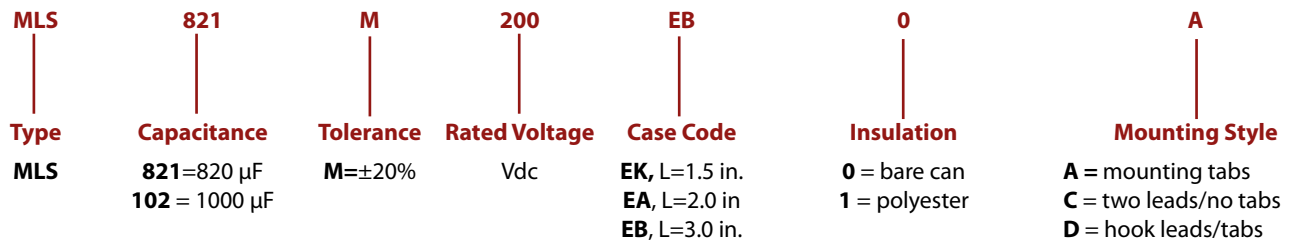
Temperature Range	-55 °C to +125 °C																																																												
Rated Voltage Range	5.0 Vdc to 250 Vdc																																																												
Capacitance Range	220 µF to 47,000 µF																																																												
Capacitance Tolerance	±20%																																																												
Leakage Current	≤ 0.002 CV µA, @ 25 °C and 5 mins.																																																												
Ripple Current Multipliers	<p>Case Temperature</p> <table border="1"> <thead> <tr> <th>45 °C</th> <th>55 °C</th> <th>65 °C</th> <th>75 °C</th> <th>85 °C</th> <th>95 °C</th> <th>105 °C</th> <th>115 °C</th> <th>125 °C</th> </tr> </thead> <tbody> <tr> <td>1.41</td> <td>1.32</td> <td>1.22</td> <td>1.12</td> <td>1.00</td> <td>0.87</td> <td>0.71</td> <td>0.50</td> <td>0.00</td> </tr> </tbody> </table> <p>Ambient Temperature, No Heatsink</p> <table border="1"> <thead> <tr> <th>45 °C</th> <th>55 °C</th> <th>65 °C</th> <th>75 °C</th> <th>85 °C</th> <th>95 °C</th> <th>105 °C</th> <th>115 °C</th> <th>125 °C</th> </tr> </thead> <tbody> <tr> <td>0.63</td> <td>0.58</td> <td>0.54</td> <td>0.49</td> <td>0.44</td> <td>0.38</td> <td>0.31</td> <td>0.22</td> <td>0.00</td> </tr> </tbody> </table> <p>Frequency</p> <table border="1"> <thead> <tr> <th></th> <th>50 Hz</th> <th>60 Hz</th> <th>120 Hz</th> <th>360 Hz</th> <th>1 kHz</th> <th>5 kHz</th> <th>10 kHz &amp; up</th> </tr> </thead> <tbody> <tr> <th>5 to 40 V</th> <td>0.95</td> <td>0.96</td> <td>1.00</td> <td>1.03</td> <td>1.04</td> <td>1.04</td> <td>1.04</td> </tr> <tr> <th>60 to 250 V</th> <td>0.80</td> <td>0.84</td> <td>1.00</td> <td>1.18</td> <td>1.25</td> <td>1.30</td> <td>1.30</td> </tr> </tbody> </table>	45 °C	55 °C	65 °C	75 °C	85 °C	95 °C	105 °C	115 °C	125 °C	1.41	1.32	1.22	1.12	1.00	0.87	0.71	0.50	0.00	45 °C	55 °C	65 °C	75 °C	85 °C	95 °C	105 °C	115 °C	125 °C	0.63	0.58	0.54	0.49	0.44	0.38	0.31	0.22	0.00		50 Hz	60 Hz	120 Hz	360 Hz	1 kHz	5 kHz	10 kHz & up	5 to 40 V	0.95	0.96	1.00	1.03	1.04	1.04	1.04	60 to 250 V	0.80	0.84	1.00	1.18	1.25	1.30	1.30
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Low Temperature Characteristics	<p>Impedance ratio: <math>Z_{-55^{\circ}\text{C}}/Z_{+25^{\circ}\text{C}}</math></p> <p>≤ 10 (5 - 20 Vdc)</p> <p>≤ 2 (25 - 250 Vdc)</p>																																																												
Endurance Life Test	<p>10,000 h @ full load at 85 °C</p> <p>Δ Capacitance ±10%</p> <p>ESR 200% of limit</p> <p>DCL 100% of limit</p>																																																												
DC Life Test	<p>2000 h at rated voltage &amp; 125 °C</p> <p>Δ Capacitance ±10%</p> <p>ESR 200% of limit</p> <p>DCL 100% of limit</p>																																																												
Shelf Life Test	<p>500 h at 125 °C</p> <p>Capacitance 100% of limit</p> <p>ESR 100% of limit</p> <p>DCL 100% of limit</p>																																																												
Vibration	<p>10 Hz to 2 kHz, 0.06" pp max and 10g.</p> <p>MIL-STD-202, Meth. 204</p>																																																												

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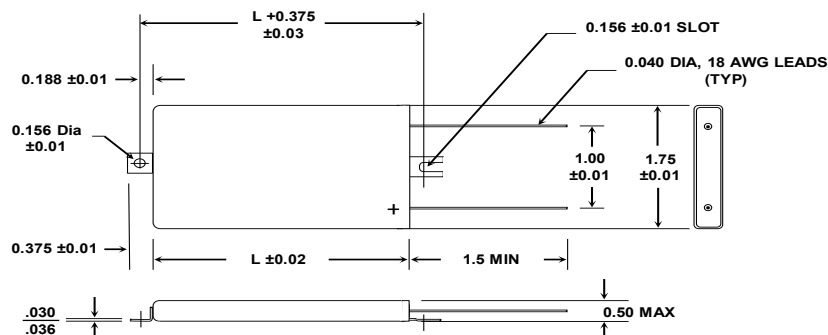
Thermal Resistance	<b>Large Sides Heatsinked</b>	<b>Case Length</b>	<b>1.5"</b>	<b>2.0"</b>	<b>3.0"</b>
		<b>Insulation</b>	<b>°C/W</b>	<b>°C/W</b>	<b>°C/W</b>
	one	None	3.3	1.8	1.3
		Polyester	4.5	2.6	1.6
	both	None	2.8	2.2	1.1
		Polyester	4.0	3.2	1.6
ESL	≤30 nH measured 1/4" from case at 1 MHz				
Weight	Case EK 43 g typical Case EA 76 g typical Case EB 92 g typical				
Terminals	18 AWG copper wire with 60/40 tin-lead electroplate, 20 amps max				
Ripple Current Capability	The ripple current capability is set by the maximum permissible internal core temperature, 125 °C.				
Air Cooled	The ripple currents in the ratings tables are for 85 °C case temperatures. For air temperatures without a heatsink use the multipliers Ambient Temperature, No Heatsink.				
Heatsink Cooled	Temperature rise from the internal hottest spot, the core, to ambient air is $\Delta T = I^2(ESR)(\theta_{cc} + \theta_{ca})$ where $\theta_{cc}$ is the thermal resistance from core to case and $\theta_{ca}$ from case to ambient. To calculate maximum ripple capability with the MLS attached to a heatsink use the maximum core temperature and the values for $\theta_{cc}$ .				
Example	As an illustration, suppose you operate an insulated MLS332M060EB1C in 65 °C air and attach it to a commercial heatsink with a free-air thermal resistance of 2.7 °C/W. Use a good thermal grease between the MLS and the heatsink, and the total thermal resistance is 2.7 + 1.8 or 4.5 °C/W. The power which would heat the core to 125 °C is (125 - 65)/4.5 or 13.3 W. For an ESR of 31 mΩ, 13.3 W equates to a ripple current of 20.7 A, however, the wire leads are rated for only 20 A.				

## Part Numbering System



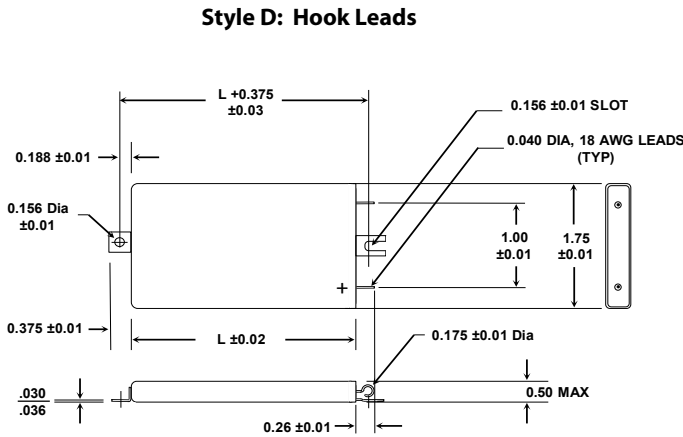
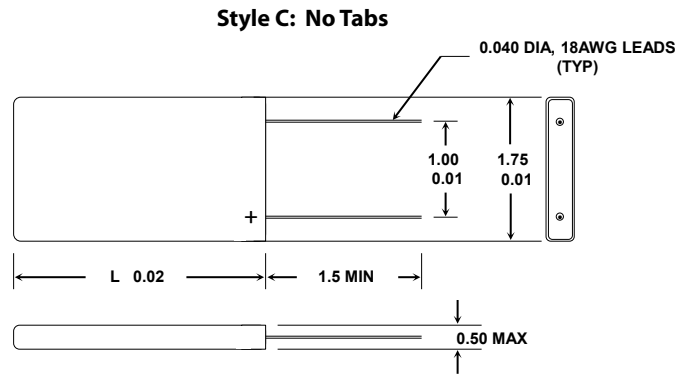
## Outline Drawings

Style A: Mounting Tabs



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## Outline Drawings



Case Code	Length L (in)	Weight (g)
EK	1.5	43
EA	2.0	76
EB	3.0	92

## Ratings

Mounting tabs are welded to the case.

Cap (µF)	Catalog Part Number	ESR max 25 °C (mΩ)		Ripple (A) Case @ 85 °C		Length (inches)
		120 Hz	20 kHz	120 Hz	20 kHz	
<b>125 °C: 5 Vdc, 105 °C: 7.5 Vdc, 25 °C Surge: 10 Vdc</b>						
19,000	MLS193M5R0EK0C	76	66	12.6	13.6	1.5
28,000	MLS283M5R0EA0c	50	44	19.9	21.4	2.0
47,000	MLS473M5R0EB0C	30	26	32.0	34.4	3.0
<b>125 °C: 7.5 Vdc, 105 °C: 10 V, 25 °C Surge: 13 Vdc</b>						
17,000	MLS173M7R5EK0C	77	67	12.5	13.5	1.5
26,000	MLS263M7R5EA0c	51	45	19.8	21.1	2.0
43,000	MLS433M7R5EB0C	31	27	31.5	33.8	3.0
<b>125 °C: 10 Vdc, 105 °C: 16 V, 25 °C Surge: 20 Vdc</b>						
13,000	MLS133M010EK0C	81	69	12.2	13.3	1.5
23,000	MLS233M010EA0C	51	45	19.8	21.1	2.0
38,000	MLS383M010EB0C	31	27	31.5	33.8	3.0
<b>125 °C: 20 Vdc, 105 °C: 30 V, 25 °C Surge: 40 Vdc]</b>						
6,800	MLS682M020EK0C	84	69	11.0	12.2	1.5
10,000	MLS103M020EA0C	56	46	13.6	15.0	2.0
17,000	MLS173M020EB0C	33	27	17.6	19.5	3.0
<b>125 °C: 40 Vdc, 105 °C: 50 V, 25 °C Surge: 63 Vdc</b>						
4,400	MLS442M040EK0C	97	70	10.3	12.1	1.5
6,600	MLS662M040EA0C	62	46	12.9	15.0	2.0
11,000	MLS113M040EB0C	36	27	16.9	19.5	3.0
<b>125 °C: 60 Vdc, 105 °C: 80 V, 25 °C Surge: 100 Vdc</b>						
1,500	MLS152M060EK0C	106	77	9.8	11.5	1.5

Cap (µF)	Catalog Part Number	ESR max 25 °C (mΩ)		Ripple (A) Case @ 85 °C		Length (inches)
		120 Hz	20 kHz	120 Hz	20 kHz	
2,100	MLS212M060EA0C	72	52	11.9	14.1	2.0
3,300	MLS332M060EB0C	44	31	15.3	18.2	3.0
<b>125 °C: 75 Vdc, 105 °C: 100 V, 25 °C Surge: 125 Vdc</b>						
1,100	MLS112M075EK0C	112	78	9.6	11.5	1.5
1,600	MLS162M075EA0C	76	54	11.6	13.8	2.0
2,700	MLS272M075EB0C	46	33	14.9	17.6	3.0
<b>125 °C: 100 Vdc, 105 °C: 150 V, 25 °C Surge: 180 Vdc</b>						
500	MLS501M100EK0C	355	248	5.4	6.4	1.5
770	MLS771M100EA0C	238	166	6.6	7.8	2.0
1,300	MLS132M100EB0C	143	100	8.5	10.1	3.0
<b>125 °C: 150 Vdc, 105 °C: 200 V, 25 °C Surge: 250 Vdc</b>						
400	MLS401M150EK0C	388	253	5.1	6.4	1.5
600	MLS601M150EA0C	261	168	6.3	7.8	2.0
1,000	MLS102M150EB0C	158	100	8.1	10.1	3.0
<b>125 °C: 200 Vdc, 105 °C: 250 Vdc, 25 °C Surge: 300 Vdc</b>						
330	MLS331M200EK0C	426	258	4.9	6.2	1.5
490	MLS491M200EA0C	285	172	6.0	7.7	2.0
820	MLS821M200EB0C	172	103	7.7	10.0	3.0
<b>125 °C: 250 Vdc, 105 °C: 250 Vdc, 25 °C Surge: 300 Vdc</b>						
220	MLS221M250EK0C	597	393	4.1	5.1	1.5
330	MLS331M250EA0C	399	262	5.0	6.3	2.0
560	MLS561M250EB0C	240	157	6.5	8.1	3.0

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### Typical Performance Curves

