Type MLSH 125 °C Hermetic Slimpack, Aluminum Electrolytic Capacitor

The world's only hermetically sealed aluminum electrolytic capacitor with glass-to-metal seal, type MLSH has extraordinary long life and rugged construction for the most demanding power electronics applications.

Type MLSH has superior capacitance retention compared to axial wet tantalum capacitors at -55 °C. Packaged in a robust stainless steel case capable of withstanding 80g's, it replaces 3 or more axial wet tantalum capacitors in parallel. Unlike wet tantalums that require voltage derating at temperatures above 85 °C, type MLSH capacitors are rated for full operating voltage at 125 °C and tested to 5000 hrs at rated voltage and temperature.

Highlights

- Hermetically sealed with no dry out
- Alternative to axial wet tantalum
- High capacitance retention @ -55 ºC
- 5000 Hr DC life test
- Up to 80g vibration

Specifications

Temperature Range	–55 °C to +125 °C
Rated Voltage Range	30 Vdc to 250 Vdc
Capacitance Range	120 µF to 3200 µF
Capacitance Tolerance	±20%
Leakage Current	≤ 0.002 CV µA, @ 25 °C and 5 mins.
Ripple Current Multipliers	Case Temperature **45 °C** 1.41 | **55 °C** 1.32 | **65 °C** 1.22 | **75 °C** 1.12 | **85 °C** 1.00 | **95 °C** 0.87 | **105 °C** 0.71 | **115 °C** 0.50 | **125 °C** 0.00 Ambient Temperature, No Heatsink **45 °C** 0.63 | **55 °C** 0.58 | **65 °C** 0.54 | **75 °C** 0.49 | **85 °C** 0.44 | **95 °C** 0.38 | **105 °C** 0.31 | **115 °C** 0.22 | **125 °C** 0.00 Frequency **5 to 40 V**: 50 Hz 0.95 | 60 Hz 0.96 | 120 Hz 1.00 | 360 Hz 1.03 | 1 kHz 1.04 | 5 kHz 1.04 | 10 kHz & up 1.04 **60 to 250 V**: 50 Hz 0.80 | 60 Hz 0.84 | 120 Hz 1.00 | 360 Hz 1.18 | 1 kHz 1.25 | 5 kHz 1.30 | 10 kHz & up 1.30
Low Temperature Characteristics	Impedance ratio: $Z_{-55\,°C}/Z_{+25\,°C}$ @120 Hz ≤10 (5 - 20 Vdc), ≤3 (25 - 250 Vdc)
DC Life Test	5000 h @ rated voltage at 125 °C Δ Capacitance ±20% (<50 Vdc) Δ Capacitance ±10% (>50 Vdc) ESR 200% of limit DCL 100% of limit
Shelf Life Test	5 years @ <=40 ºC, for HRMLSH 10 years @ <=40 ºC Capacitance 100% of limit ESR 100% of limit DCL ≤ 0.004 CV µA 500 h @ 125 °C Capacitance 100% of limit ESR 100% of limit DCL ≤ 0.002 CV µA
Vibration *Mounting: Vibration capability is dependent upon mounting restraint.*	Standard MLSH Flatpack: 80g MIL-STD-202, Meth. 204, Condition H

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<table>
<tr><td>Vibration Test</td><td><u>Level</u>
The specimens, while deenergized or operating under the load conditions specified, shall be subjected to the vibration amplitude, frequency range, and duration specified for each case size.
<u>Amplitude</u>
The specimens shall be subjected to a simple harmonic motion having an amplitude of either 0.06-inch double amplitude (maximum total excursion) or peak level specified above, whichever is less. The tolerance on vibration amplitude shall be ±10 percent.
<u>Frequency Range</u>
The vibration frequency shall be varied logarithmically between the approximate limits of 10 to 2,000 Hz.
<u>Sweep Time and Duration</u>
The entire frequency range of 10 to 2,000 Hz and return to 10 Hz shall be traversed in 20 minutes. This cycle shall be performed 12 times in each of three mutually perpendicular directions (total of 36 times), so that the motion shall be applied for a total period of approximately 12 hours. Interruptions are permitted provided the requirements for rate of change and test duration are met.</td></tr>
<tr><td>High Reliability Test/Burn-in</td><td>Established Reliability capacitors shall be subjected to a minimum of 100 percent of the DC rated voltage at 85 °C for 48 hours minimum but not to exceed 96 hours. During this test, capacitors shall be adequately protected against temporary voltage surges of 10 percent or more of the test voltage. After burn-in, the capacitors shall be returned to room ambient conditions and the DC leakage, capacitance, and ESR shall be measured with respect to specified limits.</td></tr>
<tr><td>Thermal Resistance</td><td>
<table>
<tr><th rowspan="2">Large Sides Heatsinked</th><th>Case Length</th><th>1.5"</th></tr>
<tr><th>Insulation</th><th>°C/W</th></tr>
<tr><td rowspan="2">one</td><td>None</td><td>6.6</td></tr>
<tr><td>Polyester</td><td>7.2</td></tr>
<tr><td rowspan="2">both</td><td>None</td><td>4.4</td></tr>
<tr><td>Polyester</td><td>4.7</td></tr>
</table>
</td></tr>
<tr><td>Typical Weight</td><td>Case JK - 32g</td></tr>
<tr><td>Terminals</td><td>18 AWG copper wire with 60/40 tin-lead electroplate, 20 amps max</td></tr>
<tr><td>Ripple Current Capability</td><td>The ripple current capability is set by the maximum permissible internal core temperature, 125 °C.</td></tr>
<tr><td>Air Cooled</td><td>The ripple currents in the ratings tables are for 85 °C case temperatures. For air temperatures without a heatsink use the multipliers for Ambient Temperature, No Heatsink.</td></tr>
<tr><td>Heatsink Cooled</td><td>Temperature rise from the hottest internal spot, the core, to ambient air is
$\Delta T = I^2(ESR)(\theta cc + \theta ca)$, recommended max ΔT of 30 °C
where θcc is the thermal resistance from core to case and θca from case to ambient. To calculate maximum ripple capability with the MLSH attached to a heatsink use the maximum core temperature and the values for θcc.</td></tr>
<tr><td>Example</td><td>As an illustration, suppose you operate an noninsulated MLSH172M050JK0C in 95 °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 MLSH and the heatsink, and the total thermal resistance is 2.7 +6. 6 or 9.3° C/W. The power which would heat the core to 125 °C is (125 - 95)/9. 3 or 3.2 W. For an ESR of 108 mΩ, 3.2 W equates to a ripple current of 5.45 A.</td></tr>
</table>

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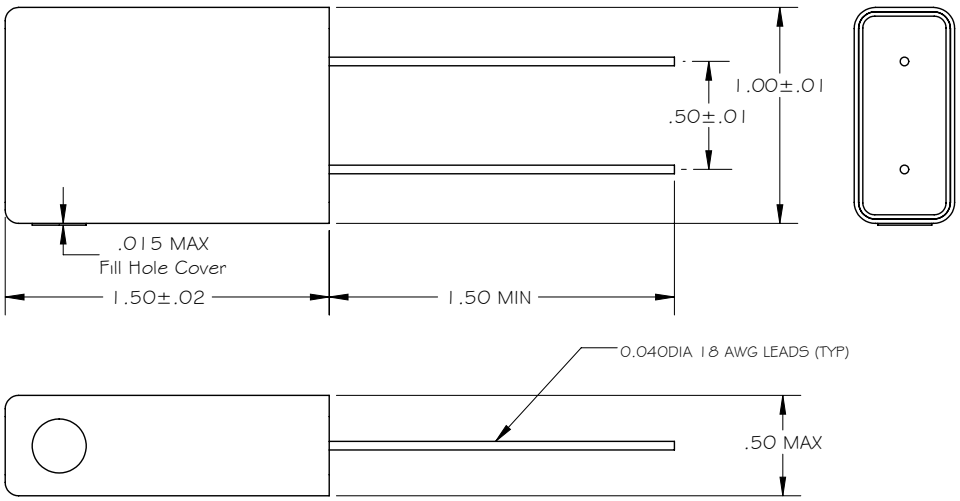
Part Numbering System

MLSH	322	M	200	JK	0	A
Type	**Capacitance**	**Tolerance**	**Rated Voltage**	**Case Code**	**Insulation**	**Mounting Style**
MLSH	**322** =3200 µF **222** = 2200 µF **172** = 1700 µF	**M=**±20%	030 = 30 Vdc 075 = 75 Vdc 150 = 150 Vdc 200 = 200 Vdc	**JK,** L=1.5 in.	**0** = bare can **1** = polyester	**C** = two leads/no tabs

Outline Drawing

Note: The polyester tape wrap may add up to 0.020 inches to the thickness and width of the capacitor.



- Stainless steel case
- All dimensions are in inches
- Dimensions are for bare can, non-insulated

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Ratings

Voltage	Cap (µF)	Catalog Part Number	Length	ESR max 25 °C (Ω)		Ripple (A) Case @ 85°C	
				120 Hz	10 kHz	120 Hz	10 kHz
30 Vdc @ 125 °C 36 Vdc @ 105 °C 50 Vdc Surge @25 °C	3200	MLSH322M030JK0C	1.5	0.103	0.098	6.6	6.8
40 Vdc @ 125 °C 48 Vdc @ 105 °C 63 Vdc Surge @25 °C	2200	MLSH222M040JK0C	1.5	0.105	0.1	6.6	6.8
50 Vdc @ 125°C 60 Vdc @ 105°C 75 Vdc Surge @25°C	1700	MLSH172M050JK0C	1.5	0.108	0.101	6.6	6.8
60 Vdc @ 125°C 72 Vdc @ 105°C 90 Vdc Surge @25°C	1100	MLSH112M060JK0C	1.5	0.109	0.103	6.5	6.8
75 Vdc @ 125°C 90 Vdc @ 105°C 112 Vdc Surge @25°C	700	MLSH701M075JK0C	1.5	0.246	0.234	4.0	4.2
100 Vdc @ 125°C 120 Vdc @ 105°C 150 Vdc Surge @25°C	400	MLSH401M100JK0C	1.5	0.960	0.768	2.1	2.4
150 Vdc @ 125°C 180 Vdc @ 105°C 225 Vdc Surge @25°C	210	MLSH211M150JK0C	1.5	1.019	0.815	2.2	2.4
200 Vdc @ 125°C 250 Vdc @ 105°C 300 Vdc Surge @25°C	160	MLSH161M200JK0C	1.5	1.274	1.019	1.9	2.1
250 Vdc @ 125°C 275 Vdc @ 105°C 350 Vdc Surge @25°C	120	MLSH121M250JK0C	1.5	1.200	0.96	1.9	2.2

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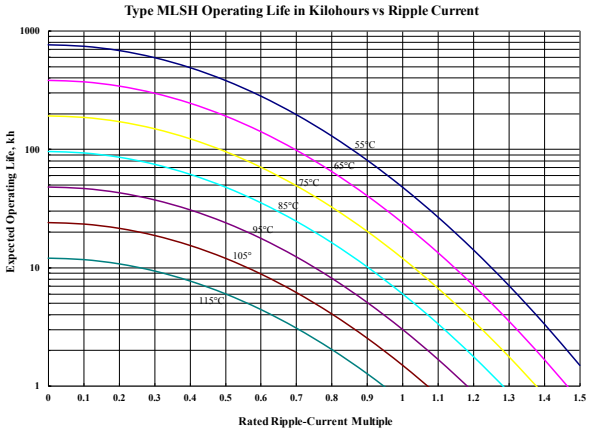
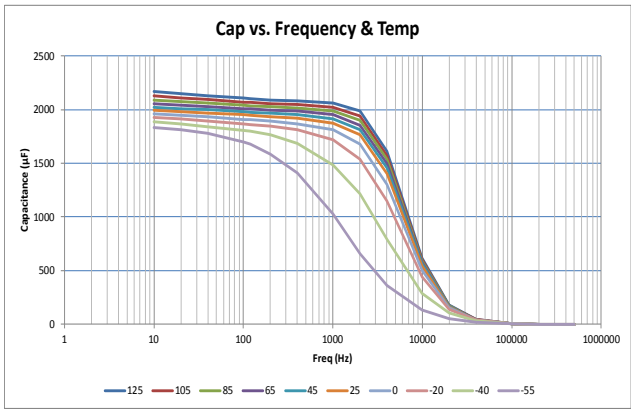
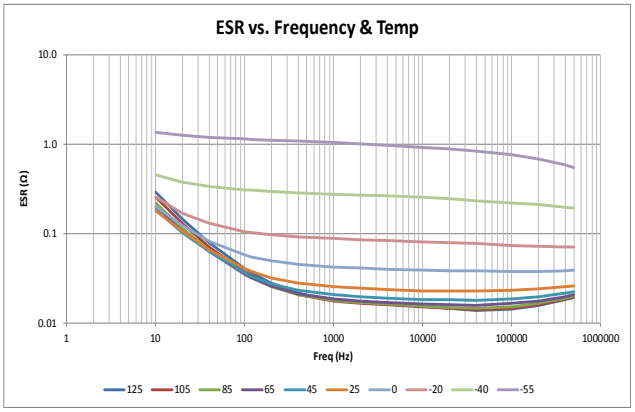
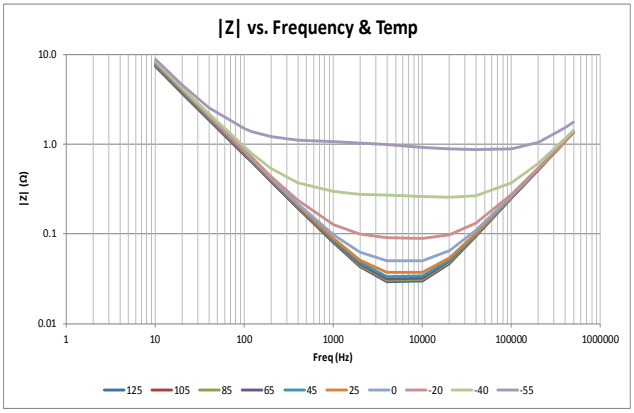
Typical Performance Curves



MLSH222M640JK0C







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