

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

Now Available with High Vibration and High Reliability Options



Encased in rugged stainless steel, the MLS is perfect for high reliability military systems and applications operating above 85 °C. For our highest performing 125 °C Flatpacks, choose type HVMLS available in a special stainless steel case for high vibration applications up to 50g. Specify type HRMLS for high reliability Flatpacks which are subjected to MIL level burn-in processes to ensure established reliability.

Highlights

- Near-hermetic welded seal
- Stainless-steel case
- 100 years expected operating life
- Withstands more than 80,000 feet altitude
- Type HV up to 50g
- Type HR, High Reliability

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 | Case Temperature | | | | | | | | | | |
| | 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 | | |
| | Ambient Temperature, No Heatsink | | | | | | | | | | |
| | 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 | | |
| | Frequency | | | | | | | | | | |
| | | 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 | | | |
| Low Temperature Characteristics | Impedance ratio: $Z_{-55^{\circ}\text{C}}/Z_{+25^{\circ}\text{C}}$ ≤ 10 (5 - 20 Vdc) ≤ 2 (25 - 250 Vdc) | | | | | | | | | | |
| Endurance Life Test | 10,000 h @ full load at 85 °C Δ Capacitance ±10% ESR 200% of limit DCL 100% of limit | | | | | | | | | | |
| DC Life Test | 2000 h at rated voltage & 125 °C Δ Capacitance ±10% ESR 200% of limit DCL 100% of limit | | | | | | | | | | |
| Shelf Life Test | 500 h at 125 °C Capacitance 100% of limit ESR 100% of limit DCL 100% of limit | | | | | | | | | | |
| Vibration | Standard MLS Flatpack: 10g 10 Hz to 2 kHz Sine Swept, 0.06" pp max and 10g. Type HVMLS Flatpack 1.5" and 2.0" case length, 50g Type HVMLS Flatpack 2.5" and 3.0" case length, 30g MIL-STD-202, Meth. 204, Sine Swept, IEC 60068-2-6 | | | | | | | | | | |
| <i>Mounting: Vibration capability is dependent upon mounting restraint. The optional welded mounting tabs, alone, are not capable of sustaining the high vibration levels. To achieve the high vibration levels as published on right, additional mounting restraint is required.</i> | | | | | | | | | | | |

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

Available with High Vibration and High Reliability Options

| Vibration Test | Level 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|-----------------------------------|--------------------|-------------|-------------|-------------|-------------------|-------------|-------------|-------------|-----|------|-----|-----|-----|-----------|-----|-----|-----|------|------|-----|-----|-----|-----------|-----|-----|-----|
| | Amplitude 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 (XXg peak), whichever is less. The tolerance on vibration amplitude shall be ± 10 percent. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Frequency Range The vibration frequency shall be varied logarithmically between the approximate limits of 10 to 2,000 Hz. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sweep Time and Duration 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High Reliability Test/Burn-in | 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thermal Resistance | <table border="1"><thead><tr><th rowspan="2">Large Sides Heatsinked</th><th>Case Length</th><th>1.5"</th><th>2.0"</th><th>3.0"</th></tr><tr><th>Insulation</th><th>°C/W</th><th>°C/W</th><th>°C/W</th></tr></thead><tbody><tr><td rowspan="2">one</td><td>None</td><td>4.3</td><td>3.1</td><td>2.0</td></tr><tr><td>Polyester</td><td>4.7</td><td>3.4</td><td>2.2</td></tr><tr><td rowspan="2">both</td><td>None</td><td>2.8</td><td>2.0</td><td>1.3</td></tr><tr><td>Polyester</td><td>3.0</td><td>2.2</td><td>1.4</td></tr></tbody></table> | Large Sides Heatsinked | Case Length | 1.5" | 2.0" | 3.0" | Insulation | °C/W | °C/W | °C/W | one | None | 4.3 | 3.1 | 2.0 | Polyester | 4.7 | 3.4 | 2.2 | both | None | 2.8 | 2.0 | 1.3 | Polyester | 3.0 | 2.2 | 1.4 |
| Large Sides Heatsinked | Case Length | | 1.5" | 2.0" | 3.0" | | | | | | | | | | | | | | | | | | | | | | | |
| | Insulation | °C/W | °C/W | °C/W | | | | | | | | | | | | | | | | | | | | | | | | |
| one | None | 4.3 | 3.1 | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | Polyester | 4.7 | 3.4 | 2.2 | | | | | | | | | | | | | | | | | | | | | | | | |
| both | None | 2.8 | 2.0 | 1.3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | Polyester | 3.0 | 2.2 | 1.4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Case Material | Stainless Steel | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 θ_{cc} is the thermal resistance from core to case and θ_{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 θ_{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. | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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

Available with High Vibration and High Reliability Options

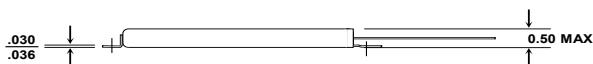
Part Numbering System

| HV | HR | MLS | 821 | M | 200 | EB | 0 | A |
|-----------------------------------|------------------|------|--|-----------|---------------|--|-------------------------------|---|
| Optional | Optional | Type | Capacitance | Tolerance | Rated Voltage | Case Code | Insulation | Mounting Style |
| High Vibration | High Reliability | MLS | 821=820 μ F 102 = 1000 μ F | M=±20% | Vdc | EK, L=1.5 in. EA, L=2.0 in. EB, L=3.0 in. * other sizes available | 0 = bare can 1 = polyester | A = mounting tabs C = two leads/no tabs D = hook leads/tabs * other mounting tab options available |
| Examples: | | | Standard MLS: MLS821M200EB0C | | | | | |
| High Reliability: | | | High Reliability: HRMLS821M200EB0C | | | | | |
| High Vibration: | | | High Vibration: HVMLS821M200EB0C | | | | | |
| High Reliability, High Vibration: | | | High Reliability, High Vibration: HVHRMLS821M200EB0C | | | | | |

Outline Drawings

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

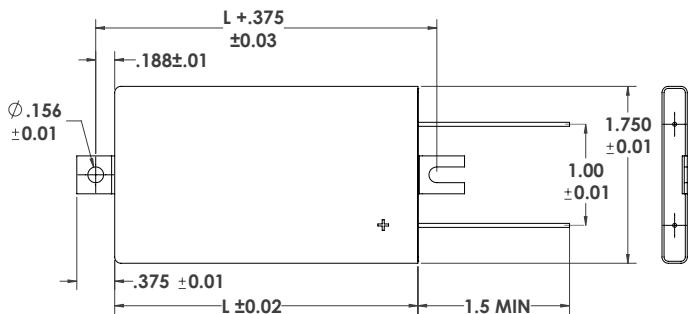
Standard Type MLS



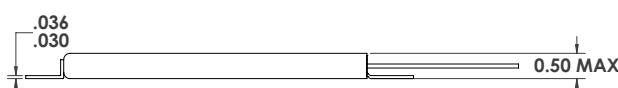
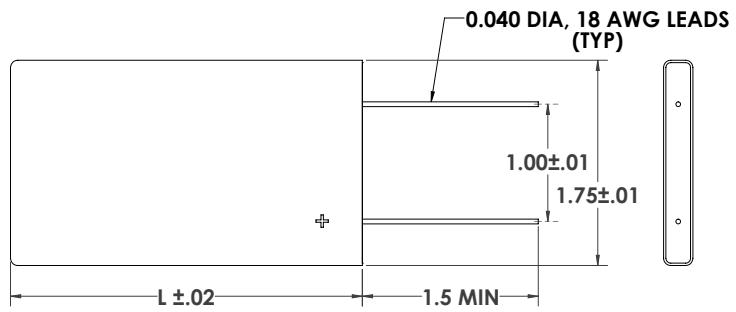
Type HV, Rilled Construction



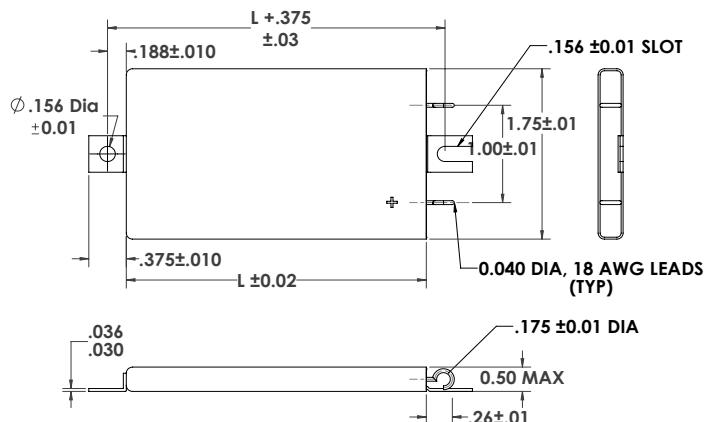
Style A: Mounting Tabs



Style C: No Tabs



Style D: Hook Leads



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

Mounting tabs are welded to the case.

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

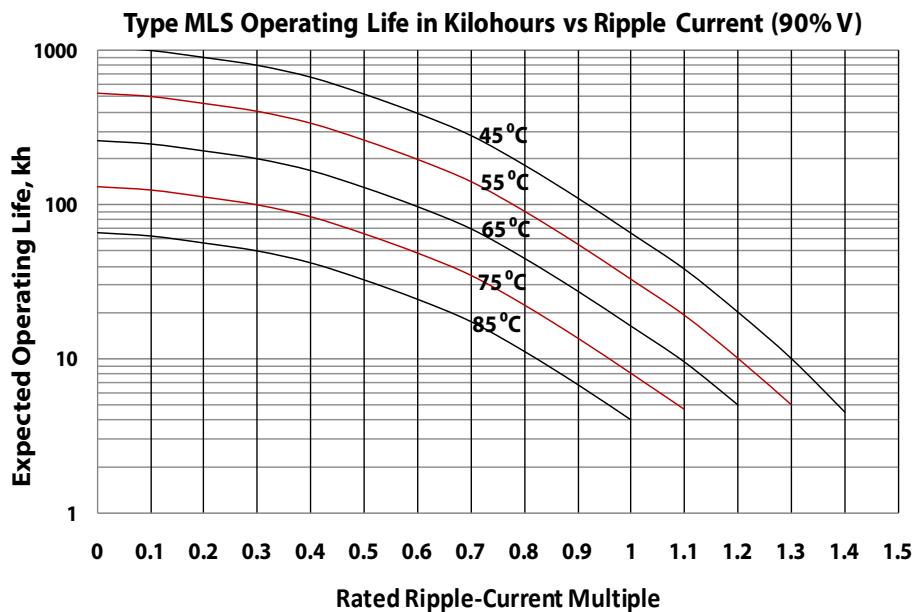
Available with High Vibration and High Reliability Options

Ratings

| Cap (μ F) | Catalog Part Number | ESR max | | Ripple (A) | | Length (inches) |
|--|---------------------|---------------------|---------------|-------------|---------------|--------------------|
| | | 25 °C (m Ω) | 120 Hz 20 kHz | Case @ 85°C | 120 Hz 20 kHz | |
| 125 °C: 5 Vdc, 105 °C: 7.5 Vdc, 25 °C Surge: 10 Vdc | | | | | | |
| 19,000 | MLS193M5R0EK0C | 76 | 66 | 11.6 | 12.5 | 1.5 |
| 28,000 | MLS283M5R0EA0C | 50 | 44 | 14.3 | 15.4 | 2.0 |
| 47,000 | MLS473M5R0EB0C | 30 | 26 | 18.5 | 19.9 | 3.0 |
| 125 °C: 7.5 Vdc, 105 °C: 10 V, 25 °C Surge: 13 Vdc | | | | | | |
| 17,000 | MLS173M7R5EK0C | 77 | 67 | 11.5 | 12.4 | 1.5 |
| 26,000 | MLS263M7R5EA0C | 51 | 45 | 14.1 | 15.1 | 2.0 |
| 43,000 | MLS433M7R5EB0C | 31 | 27 | 18.2 | 19.5 | 3.0 |
| 125 °C: 10 Vdc, 105 °C: 16 V, 25 °C Surge: 20 Vdc | | | | | | |
| 13,000 | MLS133M010EK0C | 81 | 69 | 11.3 | 12.2 | 1.5 |
| 23,000 | MLS233M010EA0C | 51 | 45 | 14.0 | 15.0 | 2.0 |
| 38,000 | MLS383M010EB0C | 31 | 27 | 18.2 | 19.5 | 3.0 |
| 125 °C: 20 Vdc, 105 °C: 30 V, 25 °C Surge: 40 Vdc | | | | | | |
| 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 |
| 125 °C: 40 Vdc, 105 °C: 50 V, 25 °C Surge: 63 Vdc | | | | | | |
| 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 |
| 125 °C: 60 Vdc, 105 °C: 80 V, 25 °C Surge: 100 Vdc | | | | | | |
| 1,500 | MLS152M060EK0C | 106 | 77 | 9.8 | 11.5 | 1.5 |

| Cap (μ F) | Catalog Part Number | ESR max | | Ripple (A) | | Length (inches) |
|---|---------------------|---------------------|---------------|-------------|---------------|--------------------|
| | | 25 °C (m Ω) | 120 Hz 20 kHz | Case @ 85°C | 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 |
| 125 °C: 75 Vdc, 105 °C: 100 V, 25 °C Surge: 125 Vdc | | | | | | |
| 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 |
| 125 °C: 100 Vdc, 105 °C: 150 V, 25 °C Surge: 180 Vdc | | | | | | |
| 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 |
| 125 °C: 150 Vdc, 105 °C: 200 V, 25 °C Surge: 250 Vdc | | | | | | |
| 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 |
| 125 °C: 200 Vdc, 105 °C: 250 Vdc, 25 °C Surge: 300 Vdc | | | | | | |
| 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 |
| 125 °C: 250 Vdc, 105 °C: 250 Vdc, 25 °C Surge: 300 Vdc | | | | | | |
| 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 |

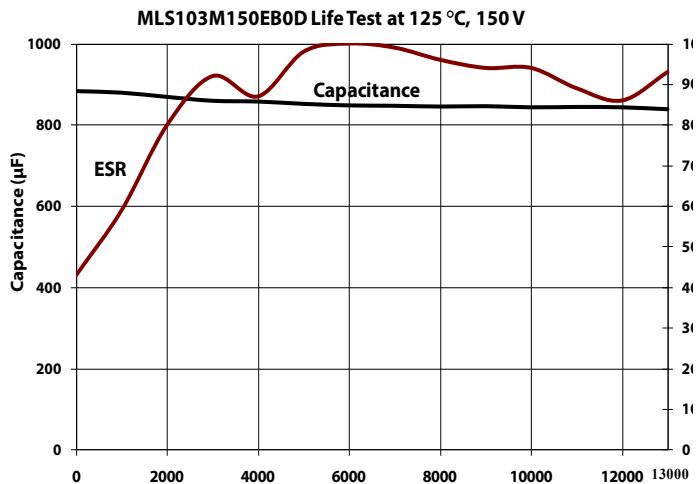
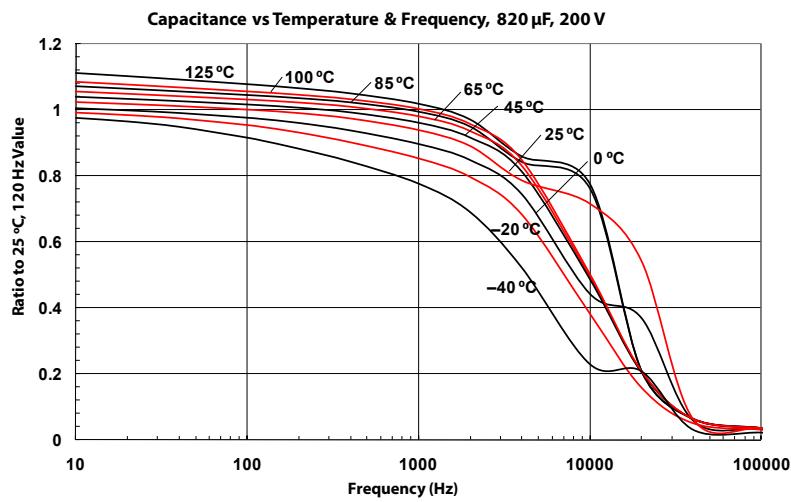
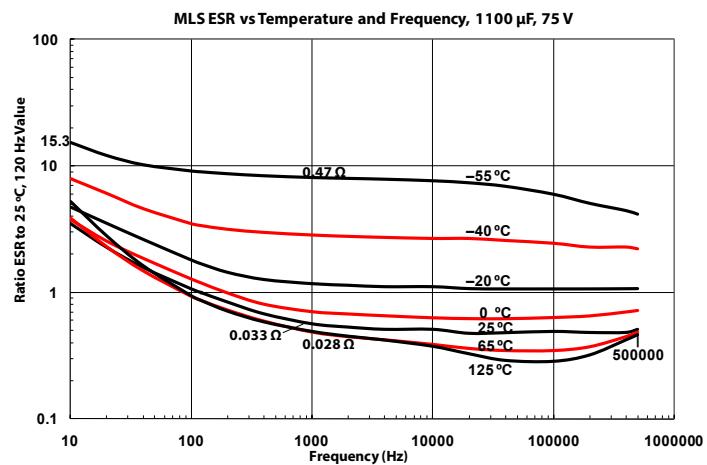
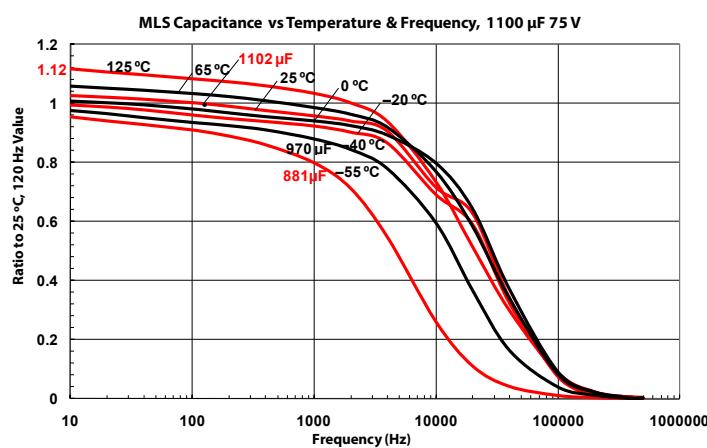
Typical Performance Curves



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

Available with High Vibration and High Reliability Options

Typical Performance Curves



Notice and Disclaimer: All product drawings, descriptions, specifications, statements, information and data (collectively, the "Information") in this datasheet or other publication are subject to change. The customer is responsible for checking, confirming and verifying the extent to which the Information contained in this datasheet or other publication is applicable to an order at the time the order is placed. All Information given herein is believed to be accurate and reliable, but it is presented without any guarantee, warranty, representation or responsibility of any kind, expressed or implied. Statements of suitability for certain applications are based on the knowledge that the Cornell Dubilier company providing such statements ("Cornell Dubilier") has of operating conditions that such Cornell Dubilier company regards as typical for such applications, but are not intended to constitute any guarantee, warranty or representation regarding any such matter – and Cornell Dubilier specifically and expressly disclaims any guarantee, warranty or representation concerning the suitability for a specific customer application, use, storage, transportation, or operating environment. The Information is intended for use only by customers who have the requisite experience and capability to determine the correct products for their application. Any technical advice inferred from this Information or otherwise provided by Cornell Dubilier with reference to the use of any Cornell Dubilier products is given gratis (unless otherwise specified by Cornell Dubilier), and Cornell Dubilier assumes no obligation or liability for the advice given or results obtained. Although Cornell Dubilier strives to apply the most stringent quality and safety standards regarding the design and manufacturing of its products, in light of the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies or other appropriate protective measures) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage. Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated in such warnings, cautions and notes, or that other safety measures may not be required.