Type MLPS/MLPSR 105 °C Flatpack™, Ultra Long Life, Aluminum Electrolytic

Very Low Profile

Type MLPS Flatpack aluminum electrolytic capacitors offer high capacitance density in a low-profile package at 105 ºC. Their welded seals and rugged construction provide extraordinary long-life and reliability needed for ruggedized, commercial, and military-grade power supplies. MLPS Flatpacks have been fully tested to 10,000 hours at rated voltage and ripple current at 105 °C.

Highlights

- Military-grade flat electrolytics, now optimized for 105 °C applications
- Life tested to 10,000 hours @ 105 °C, Rated Vdc
- High Vibration resistance up to 20g (HV Option)
- High Reliability burn-in available (48 hrs @ Vr, 105 °C)
- Welded seal resists “dry-out,” typical of conventional electrolytics.
- Excellent capacitance retention at -55 °C

Specifications

Temperature Range	-55 ºC to 105 ºC
Nonoperating Temperature Range	-65 ºC to 105 ºC
Rated Voltage Range	7.5 Vdc to 450 Vdc
Capacitance Range	120 µF to 51,000 µF
Capacitance Tolerance	±20%
Leakage Current	5 minutes after Rated Voltage is achieved ≤0.002*C*V (µA)
Ambient Temperature & Frequency Multipliers	**Frequency only Multipliers**

Hz	50	60	120	360	1000	20000
0-50	0.83	0.82	1.00	1.02	1.05	1.06
51-100	0.79	0.81	1.00	1.06	1.14	1.15
101-200	0.75	0.78	1.00	1.10	1.28	1.34
201-300	0.70	0.72	1.00	1.10	1.32	1.39
301-450	0.71	0.73	1.00	1.07	1.22	1.29

Ambient Temperature Only Multipliers (No Heat Sink)

Temp°C	45	55	65	75	85	95	105
0-50	4.00	4.00	3.95	3.50	3.00	2.25	1.00
51-100	4.10	4.10	4.05	3.60	3.00	2.25	1.00
101-200	4.30	4.30	4.20	3.70	3.10	2.30	1.00
201-300	4.00	4.00	3.95	3.50	3.00	2.25	1.00

Ambient Air Temperature Velocity Only Multipliers (No heat sink)

Air Velocity m/sec	0.25	1.00	2.50	5.00
Ripple Current Multiplier (Bare Case)	1.00	1.18	1.37	1.51
Ripple Current Multiplier (PE Sleeved)	1.00	1.16	1.35	1.50

Air Cooled	The air flow multipliers are without a heatsink and use the multipliers at the indicated temperature. The user must also ensure the maximum peak voltage including ripple voltage that may be applied continuously between the terminals should be less than the rated voltage of the capacitor to achieve the longest life.
Typical Ripple Current Capability	The typical ripple current capability is set by the maximum permissible internal core temperature, maximum lead current capability of 20 Arms, and a maximum 20 ºC core rise (Not heatsinked), the maximum peak voltage including ripple voltage applied continuously between the terminals is less than the rated voltage of the capacitor. In addition, the user should ensure that the peak-to-peak capacitor voltage divided by the capacitor’s rated voltage VR should not exceed the greater of 10% or 0.01352 × (VDC Rated / 1[VDC])$^{1/2}$.
Terminals	MLPS: Copper wire with 60/40 tin/lead electroplate, 20 amps max MLPSR: Copper wire with brite tin electroplate, 20 amps max
Case Material	Aluminum with stainless steel sleeve. Mounting tabs & negative lead are welded to case. Stainless-steel sleeve is compression connected to aluminum case.

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Low Temperature Characteristics	(Z–55°C/Z+25°C @120Hz) ≤ 50 Vdc, Z < 10X, Capacitance loss < 30% 51 - 300 Vdc, Z < 3.6X, Capacitance loss < 30% 301 - 450Vdc, Z < 6X, Capacitance loss < 40%
DC Life Test	10000 Hours 105°C At Max Rated VDC Δ Capacitance +/- 15% ESR <2X of catalog limit DCL ≤ 0.004 CV µA
Endurance Life Test	10000 Hours 105°C At Rated Ripple Load Δ Capacitance ±15% ESR < 2X Catalog Limit DCL ≤ 0.004 CV µA
Shelf Life Test	500 Hours 105°C ~ 5 years @ <=40 °C Capacitance Inside Catalog Tolerance ESR < Catalog Limit DCL ≤ 0.004 CV µA
Vibration	**Amplitude** The specimens shall be subjected to a simple harmonic motion with the double amplitude or acceleration max levels noted below, whichever is less. **Acceleration Level** 10 g (peak) - Non HV part numbers, 20 g (peak) - for HV part numbers, HV may not be available on all sizes **Displacement Level** 0.06-inch double amplitude (maximum total excursion) **Frequency Range** The vibration frequency shall be varied logarithmically between the approximate limits of 10 to 2,000 Hz. **Sweep Time & 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. **Mounting** Vibration capability is dependent upon mounting restraint. The optional mounting pins, alone, are not capable of sustaining the high vibration levels. Additional mounting restraint may be required.
High Reliability Test/Burn-in	Established Reliability capacitors shall be subjected to a minimum of 100 percent of the dc rated voltage at 105 °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
Heat Sinked Ripple Current Application	Thermal resistance T_{CHS} Core to Heatsink (°C/W) by Case Length "L"

Code		EK	EA	EH	EB
Number of Sides Heatsinked	Code	Insulation	1.5	2	2.5	3
One large Side Heatsinked	E_	Bare can	3.78	2.87	2.32	1.95
		Polyester	4.39	3.33	2.69	2.26
Two Large Sides Heatsinked		Bare can	2.81	2.11	1.69	1.41
		Polyester	3.11	2.34	1.87	1.56

Normalized Max Arms Frequency & Temperature Multipliers (Heatsinked)

Rated VDC / Frequency Hz	50	60	120	360	1000	20000
0-50	0.95	1.13	2.27	6.00	6.00	6.00
51-100	1.43	1.72	3.43	9.03	9.03	9.03
101-200	2.03	2.44	4.88	14.31	14.31	14.31
201-300	2.83	3.40	6.79	15.89	16.34	16.34
301-450	4.08	4.89	9.79	15.06	19.41	21.48

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Heatsink Cooled	Temperature rise from the internal hottest spot, the core, to heatsink is ΔT = 0.44 (ESR)(θ_{CHS}+ θ_{HS})*(Freq Multiplier), recommended max ΔT of 0.44ºC where θ_{CHS} is the thermal resistance from core to heatsink and θ_{HS} from case to heatsink.
Example	As an illustration, suppose you operate an insulated MLPS682M063EB1C in 65 ºC air and attach it to a commercial heatsink with a free-air thermal resistance of 1.0 ºC/W for one side. Using a good thermal grease between the MLPS and the heatsink, and the total thermal resistance is 1.0 + 2.26 or 3.26 ºC/W. The power which would heat the core to 105 °C is (105 - 65)/3.26 or 12.27 W. For an ESR of 52 mΩ @ 120Hz, 12.27 W equates to a ripple current of 15.36A @ 120Hz. In addition, the user should ensure that the peak-to-peak capacitor voltage divided by the capacitor's rated voltage VR should not exceed the greater of 10% or 0.01352 × (VDC Rated / 1[VDC])$^{1/2}$. Therefore the Vpp limit for this item reduces the suggested max ripple current to 12.25 Arms.
	Regulatory Information

Part Numbering System

HV	HR	MLPS/MLPSR	100	M	200	JK	0	A
Optional	**Optional**	**Type**	**Capacitance**	**Tolerance**	**Rated Voltage**	**Case Code**	**Insulation**	**Mounting Style**
High Vibration*	**High Reliability**	**MLPS:** C>3% lead plating on wire leads **MLPSR:** Copper wire with brite tin electroplate	**100** =10 µF **101** = 100 µF **272** = 2700 µF	**M**=±20%	**200** = 200 Vdc	**See chart below**	**0** = bare **1** = polyester	**A -** Straight leads with mounting tabs **B -** 4 leads no mounting tabs **C -** Straight leads with no mounting tabs **D -** Hook leads with mounting tabs **E -** Hook leads with no mounting tabs

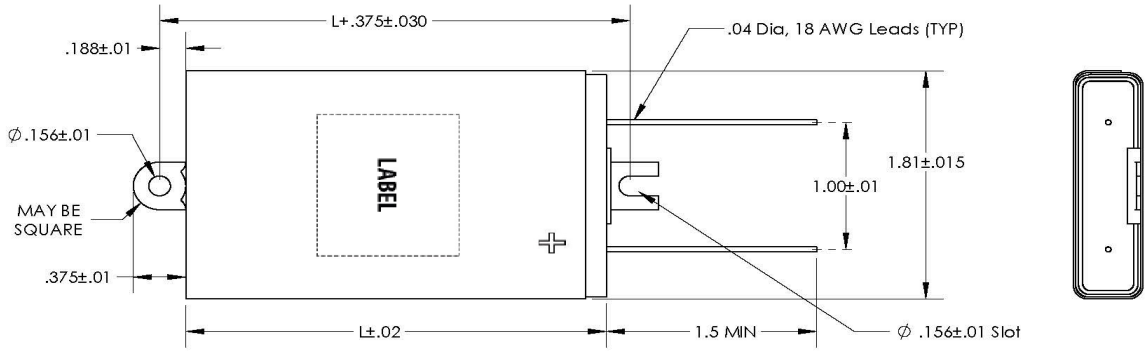
* May not be available for all sizes, consult Factory

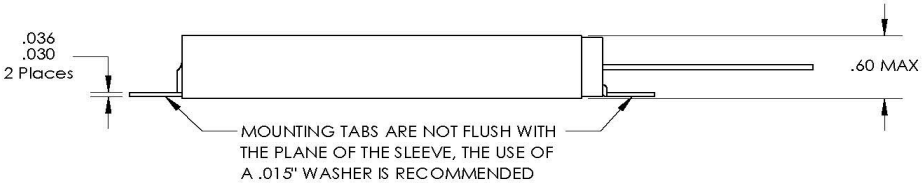
Case Code	"W"	"H"	"L"	"S"
EK	1.81	0.60	1.50	1.00
EA	1.81	0.60	2.00	1.00
EH	1.81	0.60	2.50	1.00
EB	1.81	0.60	3.00	1.00

Outline Drawing

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

Style A





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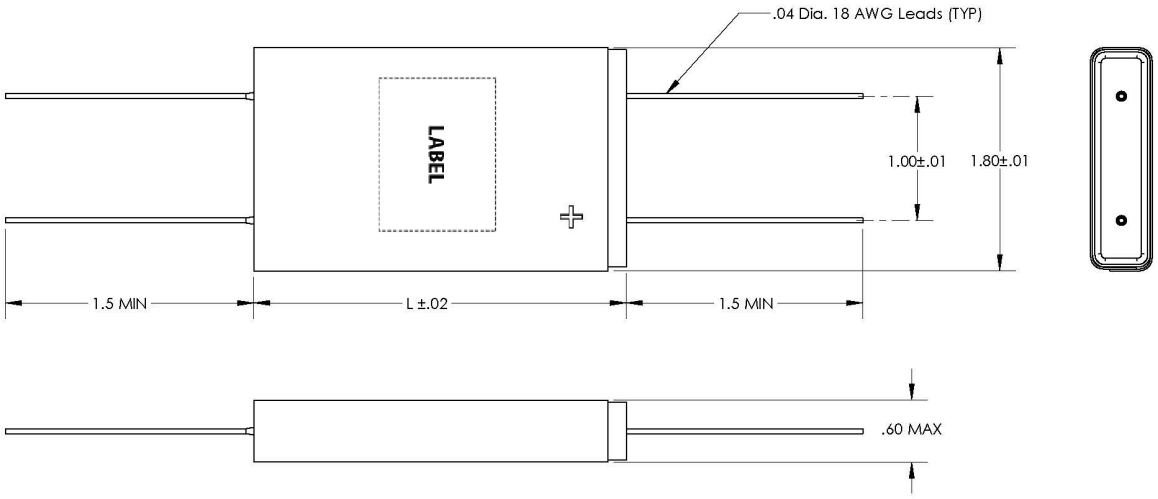
Outline Drawing

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

Style B



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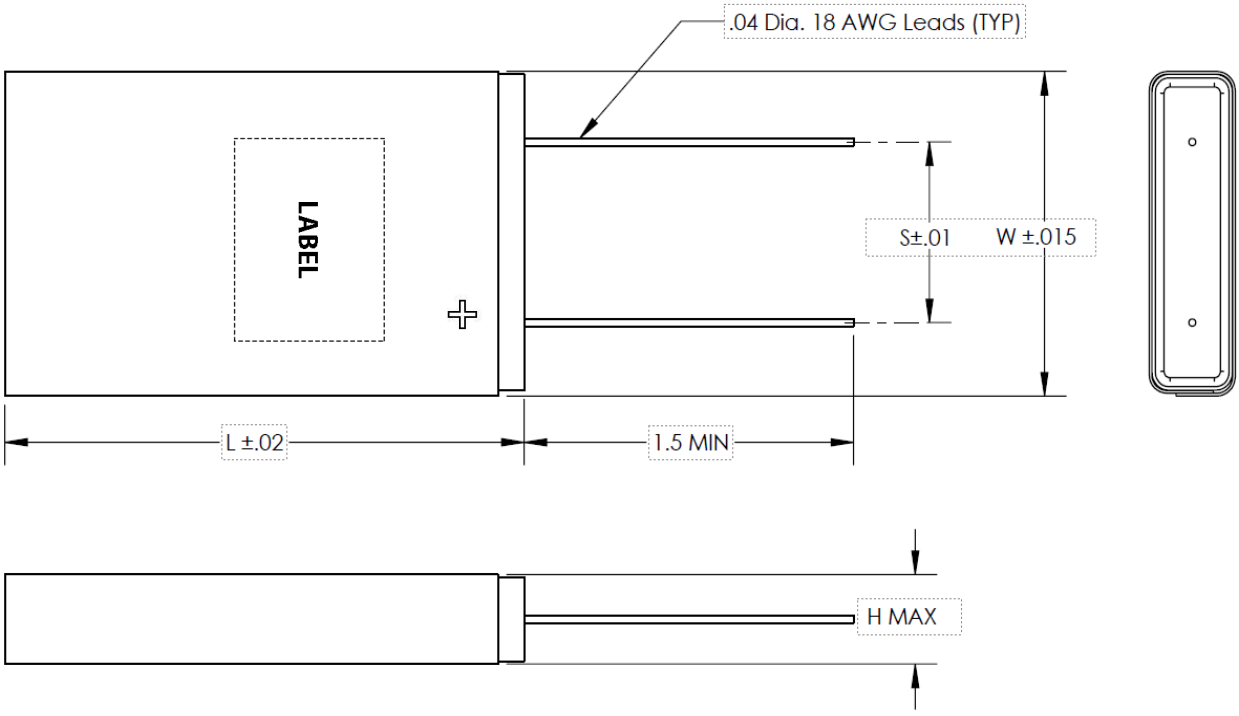

Type MLPS/MLPSR 105 °C Flatpack™, Ultra Long Life, Aluminum Electrolytic

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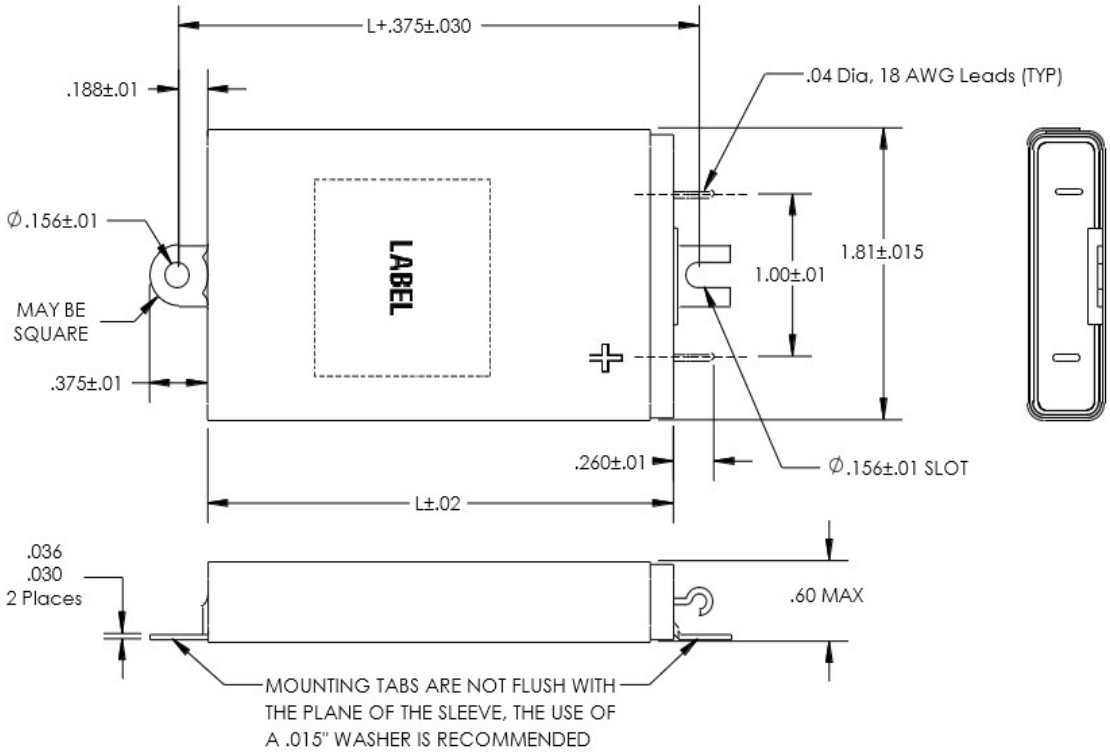
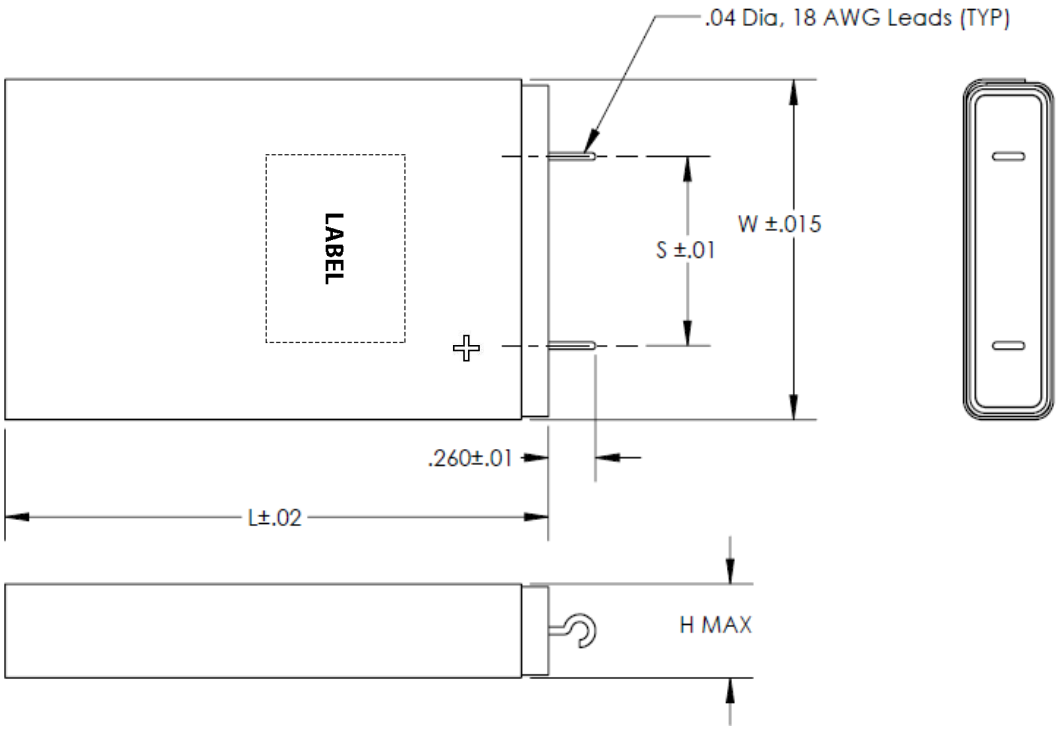
Note: The polyester tape wrap may add up to 0.020 inches to the thickness and width of the capacitor.

Style D



Style E



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Ratings

Voltage Vdc	Cap µF	P/N	120Hz 25°C mΩ ESR Max	20KHz 25°C mΩ ESR Max	105°C Arms 120Hz	105°C Arms 20KHz	Case			Surge Vdc
							H (in)	W (in)	L (in)	
7.5	20000	MLPS203M7R5EK0C	60	53	1.76	1.96	0.60	1.81	1.50	10
7.5	29000	MLPS293M7R5EA0C	42	38	2.34	2.60	0.60	1.81	2.00	10
7.5	40000	MLPS403M7R5EH0C	33	29	2.86	3.18	0.60	1.81	2.50	10
7.5	51000	MLPS513M7R5EB0C	27	24	3.33	3.71	0.60	1.81	3.00	10
10	20000	MLPS203M010EK0C	60	53	1.76	1.96	0.60	1.81	1.50	13
10	29000	MLPS293M010EA0C	42	38	2.34	2.60	0.60	1.81	2.00	13
10	40000	MLPS403M010EH0C	33	29	2.86	3.18	0.60	1.81	2.50	13
10	51000	MLPS513M010EB0C	27	24	3.33	3.71	0.60	1.81	3.00	13
16	14000	MLPS143M016EK0C	61	54	1.75	1.95	0.60	1.81	1.50	20
16	22000	MLPS223M016EA0C	43	38	2.32	2.58	0.60	1.81	2.00	20
16	30000	MLPS303M016EH0C	33	29	2.85	3.16	0.60	1.81	2.50	20
16	38000	MLPS383M016EB0C	28	25	3.32	3.69	0.60	1.81	3.00	20
20	12000	MLPS123M020EK0C	62	54	1.74	1.93	0.60	1.81	1.50	25
20	17000	MLPS173M020EA0C	43	38	2.31	2.57	0.60	1.81	2.00	25
20	24000	MLPS243M020EH0C	34	30	2.83	3.15	0.60	1.81	2.50	25
20	30000	MLPS303M020EB0C	28	25	3.30	3.67	0.60	1.81	3.00	25
25	7800	MLPS782M025EK0C	64	57	1.70	1.89	0.60	1.81	1.50	30
25	11000	MLPS113M025EA0C	45	40	2.26	2.51	0.60	1.81	2.00	30
25	15000	MLPS153M025EH0C	35	31	2.77	3.08	0.60	1.81	2.50	30
25	19000	MLPS193M025EB0C	29	26	3.24	3.60	0.60	1.81	3.00	30
35	5700	MLPS572M035EK0C	66	58	1.69	1.87	0.60	1.81	1.50	50
35	8400	MLPS842M035EA0C	46	41	2.24	2.49	0.60	1.81	2.00	50
35	11000	MLPS113M035EH0C	36	31	2.75	3.06	0.60	1.81	2.50	50
35	14000	MLPS143M035EB0C	30	26	3.21	3.57	0.60	1.81	3.00	50
40	5000	MLPS502M040EK0C	67	59	1.67	1.86	0.60	1.81	1.50	55
40	7400	MLPS742M040EA0C	47	41	2.22	2.47	0.60	1.81	2.00	55
40	10000	MLPS103M040EH0C	36	32	2.73	3.04	0.60	1.81	2.50	55
40	12000	MLPS123M040EB0C	30	27	3.19	3.54	0.60	1.81	3.00	55
50	3700	MLPS372M050EK0C	70	62	1.64	1.82	0.60	1.81	1.50	63
50	5400	MLPS542M050EA0C	49	43	2.17	2.42	0.60	1.81	2.00	63
50	7400	MLPS742M050EH0C	38	33	2.67	2.97	0.60	1.81	2.50	63
50	9400	MLPS942M050EB0C	31	28	3.12	3.47	0.60	1.81	3.00	63
63	2800	MLPS282M063EK0C	118	95	1.17	1.45	0.60	1.81	1.50	75
63	3900	MLPS392M063EA0C	87	70	1.51	1.87	0.60	1.81	2.00	75
63	5300	MLPS532M063EH0C	66	53	1.87	2.33	0.60	1.81	2.50	75
63	6800	MLPS682M063EB0C	53	43	2.21	2.75	0.60	1.81	3.00	75
80	1800	MLPS182M080EK0C	134	108	1.09	1.36	0.60	1.81	1.50	100
80	2700	MLPS272M080EA0C	93	75	1.47	1.82	0.60	1.81	2.00	100
80	3700	MLPS372M080EH0C	70	56	1.82	2.27	0.60	1.81	2.50	100
80	4600	MLPS462M080EB0C	56	45	2.16	2.68	0.60	1.81	3.00	100
100	1100	MLPS112M100EK0C	148	119	1.04	1.29	0.60	1.81	1.50	125
100	1600	MLPS162M100EA0C	102	82	1.39	1.73	0.60	1.81	2.00	125
100	2300	MLPS232M100EH0C	77	62	1.74	2.16	0.60	1.81	2.50	125
100	2900	MLPS292M100EB0C	62	50	2.06	2.55	0.60	1.81	3.00	125
150	600	MLPS601M150EK0C	296	186	0.70	1.09	0.60	1.81	1.50	180

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Voltage Vdc	Cap µF	P/N	120Hz 25°C mΩ ESR Max	20KHz 25°C mΩ ESR Max	105°C Arms 120Hz	105°C Arms 20KHz	Case			Surge Vdc
							H (in)	W (in)	L (in)	
150	890	MLPS891M150EA0C	202	127	0.94	1.47	0.60	1.81	2.00	180
150	1200	MLPS122M150EH0C	150	94	1.17	1.84	0.60	1.81	2.50	180
150	1500	MLPS152M150EB0C	120	75	1.40	2.20	0.60	1.81	3.00	180
200	430	MLPS431M200EK0C	325	204	0.66	1.04	0.60	1.81	1.50	250
200	690	MLPS691M200EA0C	204	128	0.93	1.47	0.60	1.81	2.00	250
200	870	MLPS871M200EH0C	165	103	1.12	1.76	0.60	1.81	2.50	250
200	1100	MLPS112M200EB0C	131	83	1.33	2.10	0.60	1.81	3.00	250
250	340	MLPS341M250EK0C	483	279	0.61	1.00	0.60	1.81	1.50	300
250	500	MLPS501M250EA0C	330	191	0.82	1.35	0.60	1.81	2.00	300
250	680	MLPS681M250EH0C	243	141	1.03	1.69	0.60	1.81	2.50	300
250	860	MLPS861M250EB0C	194	112	1.22	2.02	0.60	1.81	3.00	300
300	260	MLPS261M300EK0C	521	301	0.59	0.98	0.60	1.81	1.50	350
300	380	MLPS381M300EA0C	356	206	0.79	1.30	0.60	1.81	2.00	350
300	520	MLPS521M300EH0C	262	152	0.99	1.63	0.60	1.81	2.50	350
300	660	MLPS661M300EB0C	209	120	1.18	1.94	0.60	1.81	3.00	350
350	190	MLPS191M350EK0C	1508	1041	0.35	0.57	0.60	1.81	1.50	400
350	290	MLPS291M350EA0C	1026	708	0.48	0.77	0.60	1.81	2.00	400
350	390	MLPS391M350EH0C	753	520	0.60	0.97	0.60	1.81	2.50	400
350	500	MLPS501M350EB0C	596	411	0.72	1.16	0.60	1.81	3.00	400
400	140	MLPS141M400EK0C	1597	1102	0.34	0.56	0.60	1.81	1.50	450
400	210	MLPS211M400EA0C	1086	749	0.47	0.75	0.60	1.81	2.00	450
400	280	MLPS281M400EH0C	797	550	0.59	0.95	0.60	1.81	2.50	450
400	360	MLPS361M400EB0C	630	435	0.70	1.13	0.60	1.81	3.00	450
420	130	MLPS131M420EK0C	1614	1114	0.34	0.55	0.60	1.81	1.50	475
420	200	MLPS201M420EA0C	1097	757	0.46	0.75	0.60	1.81	2.00	475
420	270	MLPS271M420EH0C	806	556	0.58	0.94	0.60	1.81	2.50	475
420	340	MLPS341M420EB0C	637	440	0.70	1.13	0.60	1.81	3.00	475
450	120	MLPS121M450EK0C	1652	1140	0.34	0.55	0.60	1.81	1.50	500
450	180	MLPS181M450EA0C	1123	775	0.46	0.74	0.60	1.81	2.00	500
450	240	MLPS241M450EH0C	825	569	0.58	0.93	0.60	1.81	2.50	500
450	300	MLPS301M450EB0C	652	450	0.69	1.11	0.60	1.81	3.00	500

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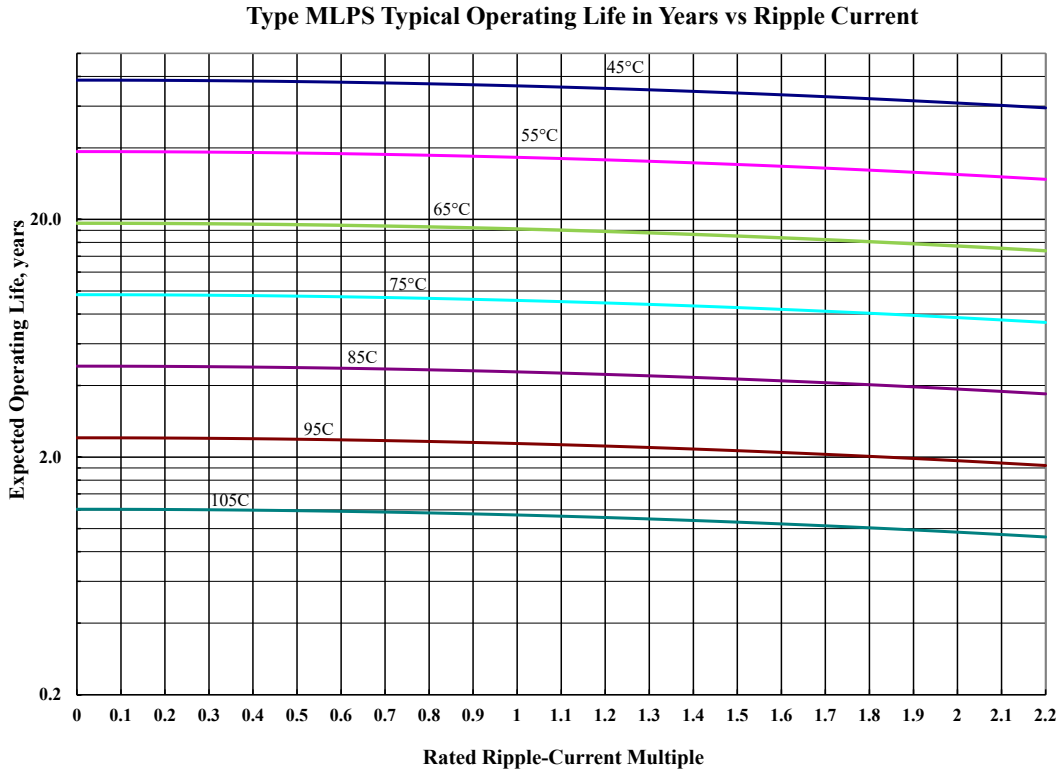
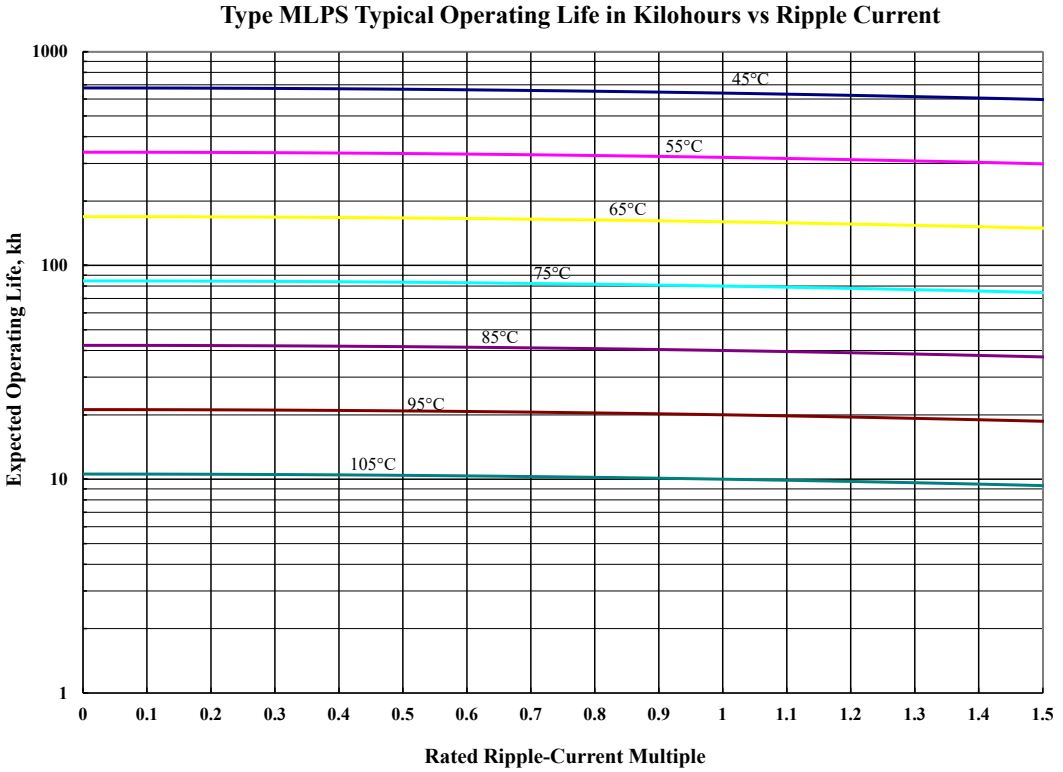
Typical Performance Curves





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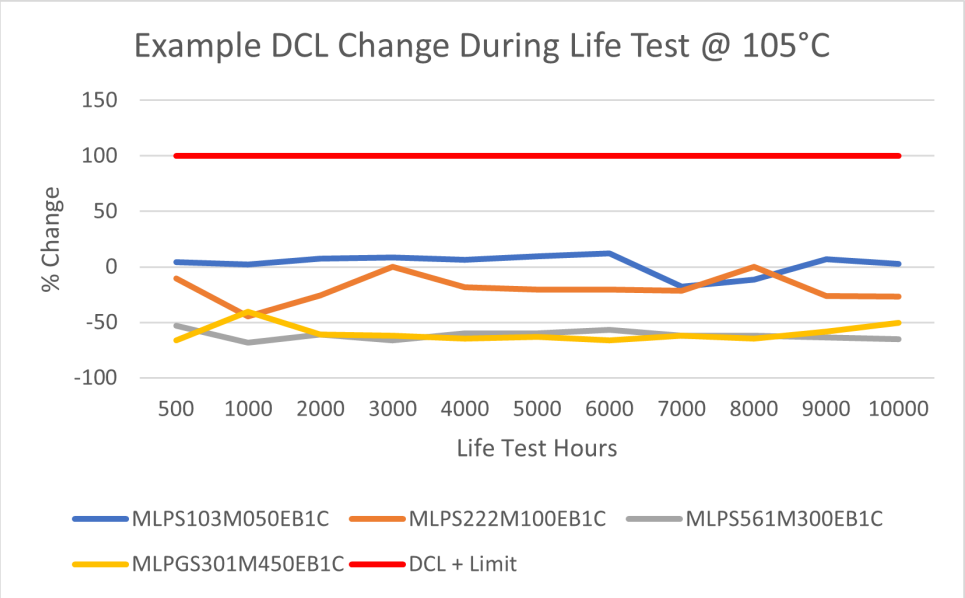

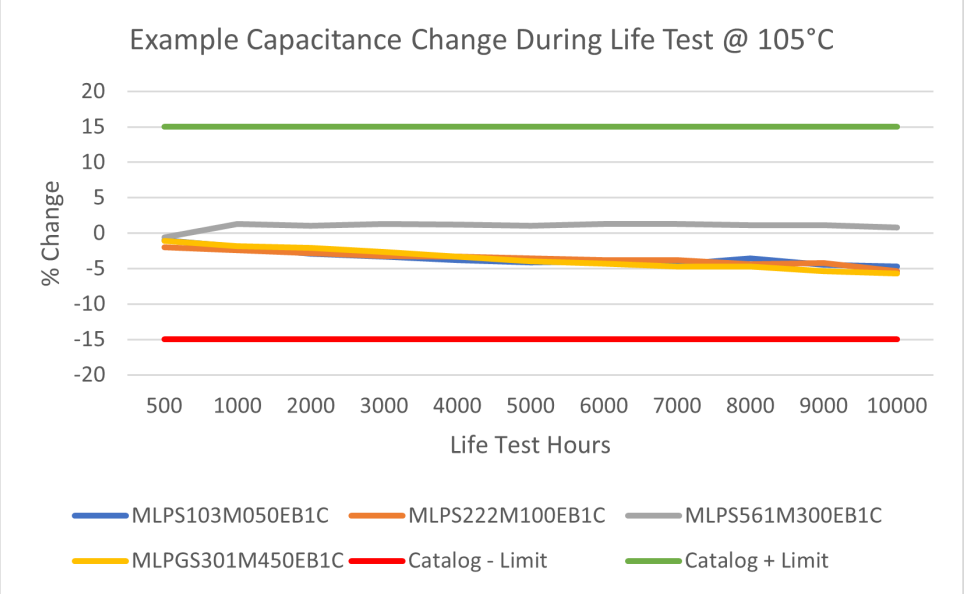

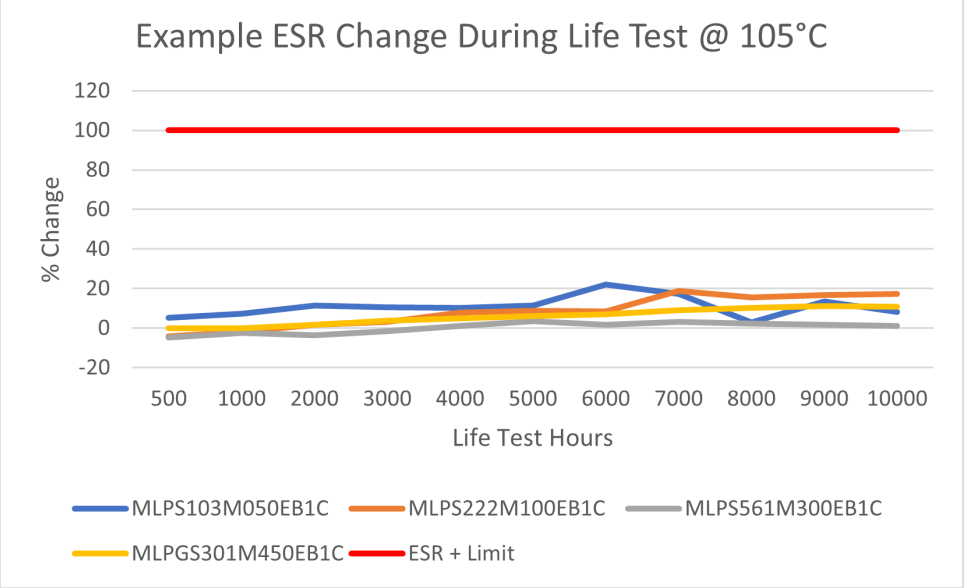

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Cornell Dubilier:

MLPS112M100EK0C MLPS301M450EB0C MLPS341M250EK0C MLPS341M420EB0C MLPS361M400EB0C MLPS372M050EK0C MLPS782M025EK0C MLPS842M035EA0C MLPS871M200EH0C MLPS891M150EA0C MLPS942M050EB0C MLPS572M035EK0C MLPS601M150EK0C MLPS681M250EH0C MLPS691M200EA0C MLPS742M040EA0C MLPS742M050EH0C MLPS501M350EB0C MLPS513M010EB0C MLPS513M7R5EB0C MLPS521M300EH0C MLPS532M063EH0C MLPS542M050EA0C MLPS392M063EA0C MLPS403M010EH0C MLPS403M7R5EH0C MLPS431M200EK0C MLPS462M080EB0C MLPS501M250EA0C MLPS303M016EH0C MLPS303M020EB0C MLPS372M080EH0C MLPS381M300EA0C MLPS383M016EB0C MLPS391M350EH0C MLPS281M400EH0C MLPS282M063EK0C MLPS291M350EA0C MLPS292M100EB0C MLPS293M010EA0C MLPS293M7R5EA0C MLPS232M100EH0C MLPS241M450EH0C MLPS243M020EH0C MLPS261M300EK0C MLPS271M420EH0C MLPS272M080EA0C MLPS193M025EB0C MLPS201M420EA0C MLPS203M010EK0C MLPS203M7R5EK0C MLPS211M400EA0C MLPS223M016EA0C MLPS153M025EH0C MLPS162M100EA0C MLPS173M020EA0C MLPS181M450EA0C MLPS182M080EK0C MLPS191M350EK0C MLPS123M040EB0C MLPS131M420EK0C MLPS141M400EK0C MLPS143M016EK0C MLPS143M035EB0C MLPS152M150EB0C MLPS112M200EB0C MLPS113M025EA0C MLPS113M035EH0C MLPS121M450EK0C MLPS122M150EH0C MLPS123M020EK0C MLPS502M040EK0C MLPS661M300EB0C MLPS682M063EB0C MLPS861M250EB0C MLPS103M040EH0C