

# Type THA, Thinpack™, Aluminum Electrolytic Capacitor, 85 °C

## High Energy Density



## Type THA now has longer life!

At 8.2 mm thin, type THA Thinpack™ offers the highest energy density available in a low profile aluminum electrolytic. It's ideal for the lowest profile circuits where high capacitance is needed for bulk storage. Look to type THA to replace arrays of SMT solid tantalum or aluminum electrolytic capacitors.

### Highlights

- 8.2 mm profile
- Very high energy density (up to 1.1 J/cc)
- 5000 hr life @ 85 °C (All 2020 production and beyond)

## Specifications

Temperature Range	-55 °C to +85 °C ≤300 Vdc; -40 °C to 85 °C ≥350 Vdc																																																																																															
Rated Voltage Range	10 Vdc to 450 Vdc																																																																																															
Capacitance Range	60 µF to 18000 µF																																																																																															
Capacitance Tolerance	±20%																																																																																															
Leakage Current	≤ 0.002 CV µA, @ 25 °C and 5 mins. at rated voltage																																																																																															
Ripple Current Multipliers	<table border="1"> <thead> <tr> <th colspan="6">Ambient Temperature Multipliers</th> </tr> <tr> <th>Temp</th> <th>45</th> <th>55</th> <th>65</th> <th>75</th> <th>85</th> </tr> </thead> <tbody> <tr> <td><b>0-300 VDC</b></td> <td>1.30</td> <td>1.25</td> <td>1.00</td> <td>0.70</td> <td>0.20</td> </tr> <tr> <td><b>301-450 VDC</b></td> <td>1.15</td> <td>1.10</td> <td>1.00</td> <td>0.60</td> <td>0.20</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="5">Ambient Air Temperature Multipliers (No heat sink)</th> </tr> <tr> <th>Air Velocity m/sec</th> <th>0.25</th> <th>1.00</th> <th>2.50</th> <th>5.00</th> </tr> </thead> <tbody> <tr> <td><b>Ripple Current Multiplier</b></td> <td>1.00</td> <td>1.20</td> <td>1.40</td> <td>1.50</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="8">Frequency Multipliers</th> </tr> <tr> <th>Rated Vdc/Freq</th> <th>50</th> <th>60</th> <th>120</th> <th>360</th> <th>1000</th> <th>5000</th> <th>20000</th> </tr> </thead> <tbody> <tr> <td><b>10-35</b></td> <td>0.72</td> <td>0.77</td> <td>1.00</td> <td>1.06</td> <td>1.06</td> <td>1.10</td> <td>1.10</td> </tr> <tr> <td><b>36-60</b></td> <td>0.70</td> <td>0.75</td> <td>1.00</td> <td>1.06</td> <td>1.10</td> <td>1.20</td> <td>1.20</td> </tr> <tr> <td><b>61-100</b></td> <td>0.70</td> <td>0.75</td> <td>1.00</td> <td>1.06</td> <td>1.10</td> <td>1.30</td> <td>1.30</td> </tr> <tr> <td><b>101-300</b></td> <td>0.70</td> <td>0.75</td> <td>1.00</td> <td>1.20</td> <td>1.45</td> <td>1.70</td> <td>1.70</td> </tr> <tr> <td><b>301-450</b></td> <td>0.70</td> <td>0.75</td> <td>1.00</td> <td>1.20</td> <td>1.45</td> <td>1.80</td> <td>1.80</td> </tr> </tbody> </table>	Ambient Temperature Multipliers						Temp	45	55	65	75	85	<b>0-300 VDC</b>	1.30	1.25	1.00	0.70	0.20	<b>301-450 VDC</b>	1.15	1.10	1.00	0.60	0.20	Ambient Air Temperature Multipliers (No heat sink)					Air Velocity m/sec	0.25	1.00	2.50	5.00	<b>Ripple Current Multiplier</b>	1.00	1.20	1.40	1.50	Frequency Multipliers								Rated Vdc/Freq	50	60	120	360	1000	5000	20000	<b>10-35</b>	0.72	0.77	1.00	1.06	1.06	1.10	1.10	<b>36-60</b>	0.70	0.75	1.00	1.06	1.10	1.20	1.20	<b>61-100</b>	0.70	0.75	1.00	1.06	1.10	1.30	1.30	<b>101-300</b>	0.70	0.75	1.00	1.20	1.45	1.70	1.70	<b>301-450</b>	0.70	0.75	1.00	1.20	1.45	1.80	1.80
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Low Temperature Characteristics	Impedance ratio: $Z_{-55\text{ }^\circ\text{C}}/Z_{+25\text{ }^\circ\text{C}}$ @120 Hz ≤10 (5 - 20 Vdc), ≤3 (25 - 300 Vdc) $Z_{-40\text{ }^\circ\text{C}}/Z_{+25\text{ }^\circ\text{C}}$ @120 Hz ≤10 (≥350 Vdc)																																																																																															
DC Life Test	5000 h @ rated voltage at 85 °C (date codes beyond 2020) Δ Capacitance ±20% (<50 Vdc) Δ Capacitance ±10% (≥50 Vdc) ESR 200% of limit DCL ≤ 0.004 CV µA																																																																																															
Shelf Life Test	5 yrs @ 40 °C Capacitance 100% of limit ESR 100% of limit DCL ≤ 0.004 CV µA																																																																																															

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<p><b>Vibration</b> <i>Mounting: Vibration capability is dependent upon mounting restraint.</i></p> <p><b>Vibration Test</b></p>	<p>All Sizes = 10g</p> <p><b>Level</b> 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.</p> <p><b>Amplitude</b> 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.</p> <p><b>Frequency Range</b> The vibration frequency shall be varied logarithmically between the approximate limits of 10 to 2,000 Hz.</p> <p><b>Sweep Time and Duration</b> 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.</p>																																		
<p><b>Altitude</b></p>	<p>80,000 Feet</p>																																		
<p><b>Thermal Resistance</b></p>	<table border="1"> <thead> <tr> <th colspan="2"></th> <th colspan="4"><b>Thermal Resistance (°C/W) by Case Length</b></th> </tr> <tr> <th><b># of Sides heatsinked</b></th> <th><b>Insulation</b></th> <th><b>36.4 (mm)</b></th> <th><b>45.9 (mm)</b></th> <th><b>53.8 (mm)</b></th> <th><b>66.5 (mm)</b></th> </tr> </thead> <tbody> <tr> <td rowspan="2"><b>One Side</b></td> <td>Bare can</td> <td>5.42</td> <td>4.27</td> <td>3.65</td> <td>2.96</td> </tr> <tr> <td>Polyester</td> <td>6.60</td> <td>5.20</td> <td>4.44</td> <td>3.60</td> </tr> <tr> <td rowspan="2"><b>Both Sides</b></td> <td>Bare can</td> <td>4.36</td> <td>3.41</td> <td>2.90</td> <td>2.34</td> </tr> <tr> <td>Polyester</td> <td>4.95</td> <td>3.87</td> <td>3.30</td> <td>2.66</td> </tr> </tbody> </table>			<b>Thermal Resistance (°C/W) by Case Length</b>				<b># of Sides heatsinked</b>	<b>Insulation</b>	<b>36.4 (mm)</b>	<b>45.9 (mm)</b>	<b>53.8 (mm)</b>	<b>66.5 (mm)</b>	<b>One Side</b>	Bare can	5.42	4.27	3.65	2.96	Polyester	6.60	5.20	4.44	3.60	<b>Both Sides</b>	Bare can	4.36	3.41	2.90	2.34	Polyester	4.95	3.87	3.30	2.66
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<p><b>Typical Weight</b></p>	<p>Case AA - 14g, Case AB - 16g, Case AC - 18g, Case AD - 20g</p>																																		
<p><b>Terminals</b></p>	<p>20 AWG copper wire with tin electroplate, 15 amps max</p>																																		
<p><b>Case Material</b></p>	<p>Aluminum</p>																																		
<p><b>Ripple Current Capability</b></p>	<p>The max ripple current capability is set by the target core temperature of 85 °C. The Peak to Peak ac must be less than Vr/5.</p>																																		
<p><b>Air Cooled</b></p>	<p>The ripple currents in the ratings tables are for 65 °C ambient temperatures.</p>																																		
<p><b>Heatsink Cooled</b></p>	<p>Temperature rise from the hottest internal spot, the core, to ambient air is</p> $\Delta T = I^2(\text{Max ESR})(\theta_{cc} + \theta_{ca}), \text{ recommended max } \Delta T \text{ of } 20 \text{ }^\circ\text{C}$ <p>where <math>\theta_{cc}</math> is the thermal resistance from core to case and <math>\theta_{ca}</math> from case to ambient. To calculate maximum ripple capability with the THA attached to a heatsink use the maximum core temperature and the values for <math>\theta_{cc}</math>.</p>																																		
<p><b>Example</b></p>	<p>As an illustration, suppose you operate a noninsulated THA132M060AAOC 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 capacitor and the heatsink, and the total thermal resistance is 2.7 + 5.42 or 8.12 °C/W. The power which would heat the core to 85 °C is (85 - 65)/8.12 or 2.46 W. For an ESR of 117 mΩ, 2.46 W equates to a ripple current of 4.58 A.</p>																																		
<p><a href="#">Regulatory Information</a></p>																																			

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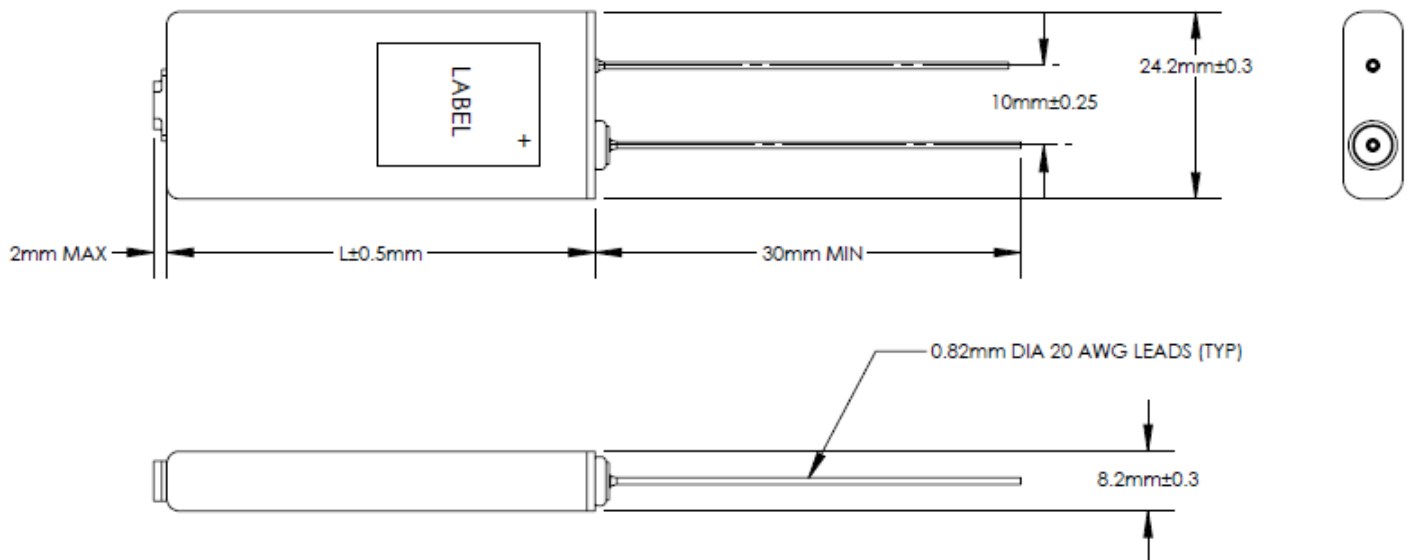
## Part Numbering System

THA	412	M	025	AA	0	C
Type	Capacitance	Tolerance	Rated Voltage	Case Code	Insulation	Mounting Style
THA	322 = 3200 $\mu$ F 222 = 2200 $\mu$ F 162 = 1600 $\mu$ F	M = $\pm$ 20%	025 = 25 Vdc 075 = 75 Vdc 150 = 150 Vdc 200 = 200 Vdc	AA = 36.4 mm AB = 45.9 mm AC = 53.8 mm AD = 66.5 mm	0 = bare can 1 = polywrap	C = two leads

## Outline Drawing

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

### Style C: No Tabs



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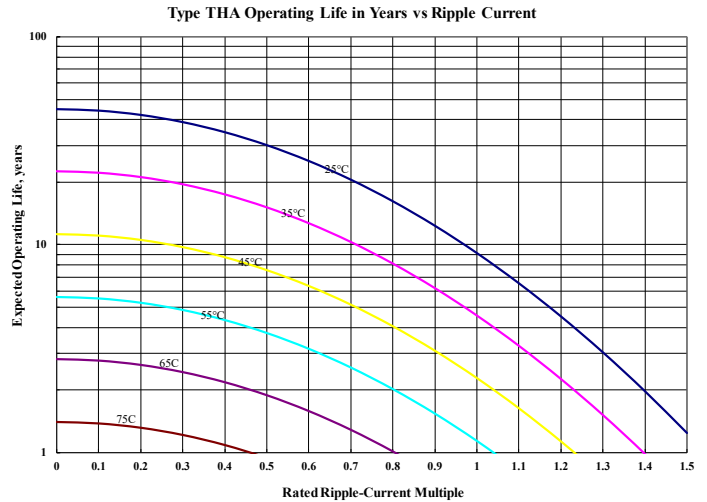
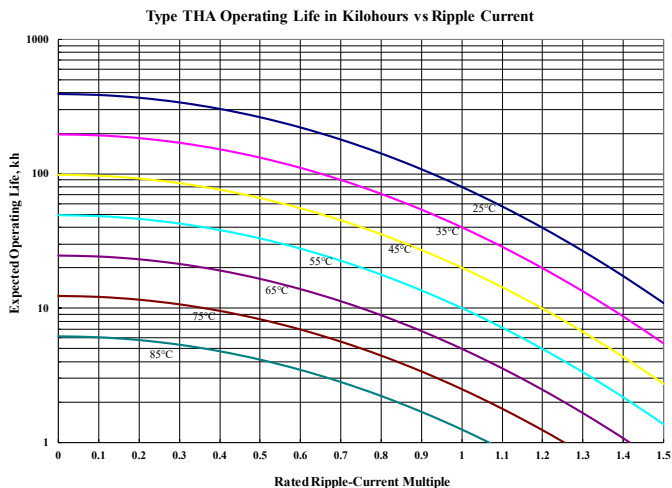
## Ratings

Voltage	Cap (µF)	Catalog Part Number	Length	ESR max 25 °C (Ω)		Ripple (A) Ambient @ 65°C	
				120 Hz	20 kHz	120 Hz	20 kHz
<b>10 Vdc @ 85 °C</b> <b>12 Vdc Surge @ 25 °C</b>	8500	THA852M010AA0C	36.4	0.12	0.09	1.90	2.09
	11000	THA113M010AB0C	45.9	0.08	0.07	1.90	2.09
	14000	THA143M010AC0C	53.8	0.07	0.06	2.50	2.75
	18000	THA183M010AD0C	66.5	0.05	0.04	3.30	3.63
<b>16 Vdc @ 85 °C</b> <b>19.2 Vdc Surge @ 25 °C</b>	6300	THA632M016AA0C	36.4	0.12	0.09	1.90	2.09
	8700	THA872M016AB0C	45.9	0.08	0.07	2.10	2.31
	10000	THA103M016AC0C	53.8	0.07	0.06	2.50	2.75
	13000	THA133M016AD0C	66.5	0.05	0.04	3.30	3.63
<b>20 Vdc @ 85 °C</b> <b>24 Vdc Surge @ 25 °C</b>	5000	THA502M020AA0C	36.4	0.12	0.09	1.90	2.09
	7000	THA702M020AB0C	45.9	0.08	0.07	2.10	2.31
	8600	THA862M020AC0C	53.8	0.07	0.06	2.50	2.75
	11000	THA113M020AD0C	66.5	0.05	0.04	3.30	3.63
<b>25 Vdc @ 85 °C</b> <b>30 Vdc Surge @ 25 °C</b>	4100	THA412M025AA0C	36.4	0.12	0.09	1.90	2.09
	5700	THA572M025AB0C	45.9	0.08	0.07	2.40	2.64
	7000	THA702M025AC0C	53.8	0.07	0.06	2.50	2.75
	9000	THA902M025AD0C	66.5	0.05	0.04	3.30	3.30
<b>30 Vdc @ 85 °C</b> <b>36 Vdc Surge @ 25 °C</b>	3300	THA332M030AA0C	36.4	0.12	0.09	1.90	2.09
	4600	THA462M030AB0C	45.9	0.08	0.07	2.40	2.64
	5700	THA572M030AC0C	53.8	0.07	0.06	2.80	3.08
	7400	THA742M030AD0C	66.5	0.05	0.04	3.30	3.63
<b>35 Vdc @ 85 °C</b> <b>42 Vdc Surge @ 25 °C</b>	2600	THA262M035AA0C	36.4	0.12	0.09	1.90	2.09
	3600	THA362M035AB0C	45.9	0.08	0.07	2.40	2.64
	4400	THA442M035AC0C	53.8	0.07	0.06	2.80	3.08
	5800	THA582M035AD0C	66.5	0.05	0.04	3.50	3.85
<b>40 Vdc @ 85 °C</b> <b>48 Vdc Surge @ 25 °C</b>	2300	THA232M040AA0C	36.4	0.12	0.09	1.70	2.04
	3200	THA322M040AB0C	45.9	0.08	0.07	2.20	2.64
	4000	THA402M040AC0C	53.8	0.07	0.06	2.50	3.00
	5200	THA522M040AD0C	66.5	0.05	0.04	3.00	3.60
<b>50 Vdc @ 85 °C</b> <b>60 Vdc Surge @ 25 °C</b>	1600	THA162M050AA0C	36.4	0.12	0.09	1.70	2.04
	2200	THA222M050AB0C	45.9	0.08	0.07	2.20	2.64
	2700	THA272M050AC0C	53.8	0.07	0.06	2.50	3.00
	3500	THA352M050AD0C	66.5	0.05	0.04	2.90	3.48
<b>60 Vdc @ 85 °C</b> <b>72 Vdc Surge @ 25 °C</b>	1300	THA132M060AA0C	36.4	0.12	0.09	1.70	2.04
	1800	THA182M060AB0C	45.9	0.08	0.07	2.20	2.64
	2300	THA232M060AC0C	53.8	0.07	0.06	2.50	3.00
	3000	THA302M060AD0C	66.5	0.05	0.04	3.30	3.96
<b>75 Vdc @ 85 °C</b> <b>90 Vdc Surge @ 25 °C</b>	730	THA731M075AA0C	36.4	0.29	0.19	1.10	1.43
	1000	THA102M075AB0C	45.9	0.21	0.14	1.40	1.82
	1200	THA122M075AC0C	53.8	0.17	0.11	1.60	2.08
	1600	THA162M075AD0C	66.5	0.13	0.09	2.00	2.60
<b>100 Vdc @ 85 °C</b> <b>120 Vdc Surge @ 25 °C</b>	580	THA581M100AA0C	36.4	0.29	0.19	1.10	1.43
	800	THA801M100AB0C	45.9	0.21	0.14	1.40	1.82
	980	THA981M100AC0C	53.8	0.17	0.11	1.60	2.08
	1200	THA122M100AD0C	66.5	0.13	0.09	2.00	2.60

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Voltage	Cap (µF)	Catalog Part Number	Length	ESR max 25 °C (Ω)		Ripple (A) Ambient @ 65°C	
				120 Hz	20 kHz	120 Hz	20 kHz
<b>150 Vdc @ 85 °C</b> <b>180 Vdc Surge @ 25 °C</b>	330	THA331M150AA0C	36.4	0.80	0.40	0.60	1.02
	450	THA451M150AB0C	45.9	0.58	0.29	0.80	1.36
	560	THA561M150AC0C	53.8	0.47	0.24	0.90	1.53
	730	THA731M150AD0C	66.5	0.37	0.18	1.20	2.04
<b>200 Vdc @ 85 °C</b> <b>240 Vdc Surge @ 25 °C</b>	170	THA171M200AA0C	36.4	0.90	0.45	0.60	1.02
	230	THA231M200AB0C	45.9	0.65	0.33	0.80	1.36
	280	THA281M200AC0C	53.8	0.53	0.27	0.90	1.53
	370	THA371M200AD0C	66.5	0.41	0.21	1.10	1.87
<b>250 Vdc @ 85 °C</b> <b>300 Vdc Surge @ 25 °C</b>	140	THA141M250AA0C	36.4	0.90	0.45	0.60	1.02
	190	THA191M250AB0C	45.9	0.65	0.33	0.80	1.36
	240	THA241M250AC0C	53.8	0.53	0.27	0.90	1.53
	310	THA311M250AD0C	66.5	0.41	0.21	1.10	1.87
<b>300 Vdc @ 85 °C</b> <b>350 Vdc Surge @ 25 °C</b>	110	THA111M300AA0C	36.4	0.90	0.45	0.60	1.02
	160	THA161M300AB0C	45.9	0.65	0.33	0.80	1.36
	190	THA191M300AC0C	53.8	0.53	0.27	0.90	1.53
	250	THA251M300AD0C	66.5	0.41	0.21	1.10	1.87
<b>350 Vdc @ 85 °C</b> <b>400 Vdc Surge @ 25 °C</b>	90	THA900M350AA0C	36.4	2.45	1.18	0.40	0.72
	130	THA131M350AB0C	45.9	1.78	0.85	0.50	0.90
	160	THA161M350AC0C	53.8	1.45	0.70	0.60	1.08
	210	THA211M350AD0C	66.5	1.12	0.54	0.80	1.44
<b>400 Vdc @ 85 °C</b> <b>450 Vdc Surge @ 25 °C</b>	80	THA800M400AA0C	36.4	2.45	1.18	0.40	0.72
	110	THA111M400AB0C	45.9	1.78	0.85	0.50	0.90
	140	THA141M400AC0C	53.8	1.45	0.70	0.60	1.08
	180	THA181M400AD0C	66.5	1.12	0.54	0.80	1.44
<b>450 Vdc @ 85 °C</b> <b>500 Vdc Surge @ 25 °C</b>	60	THA600M450AA0C	36.4	2.45	1.18	0.40	0.72
	90	THA900M450AB0C	45.9	1.78	0.85	0.50	0.90
	110	THA111M450AC0C	53.8	1.45	0.70	0.60	1.08
	140	THA141M450AD0C	66.5	1.12	0.54	0.80	1.44

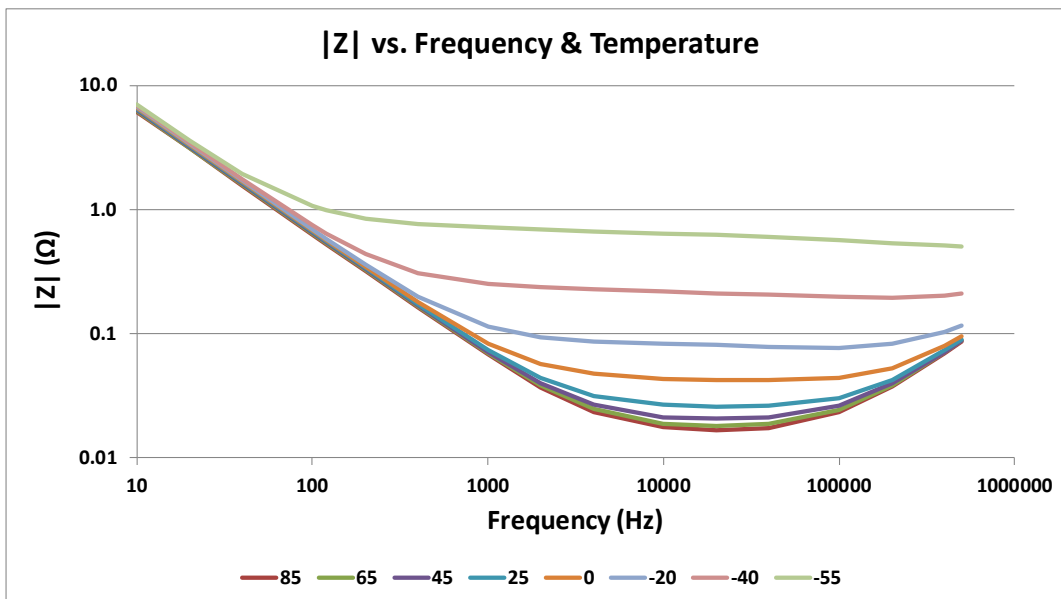
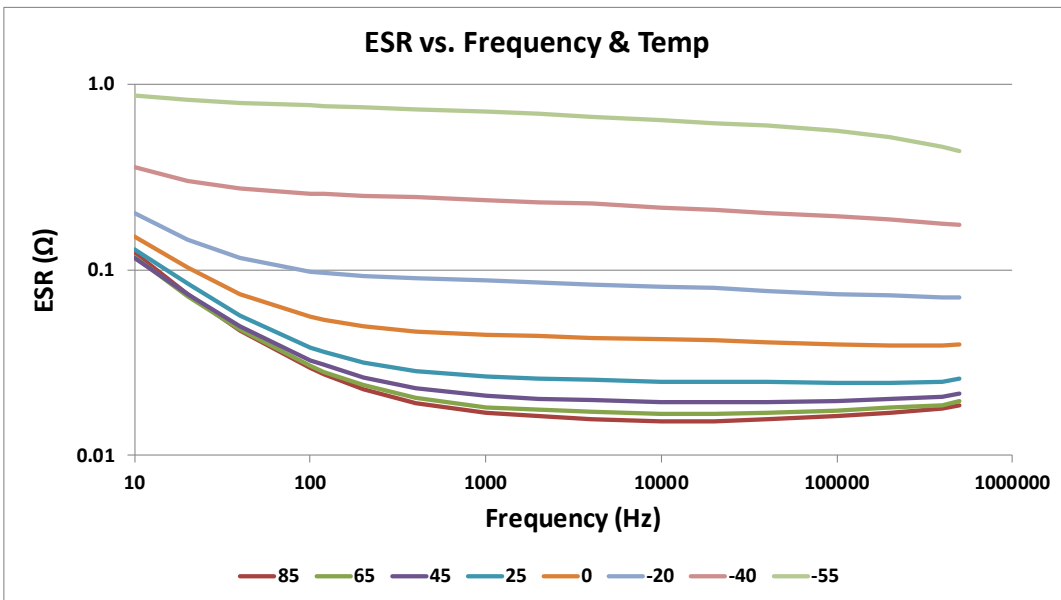
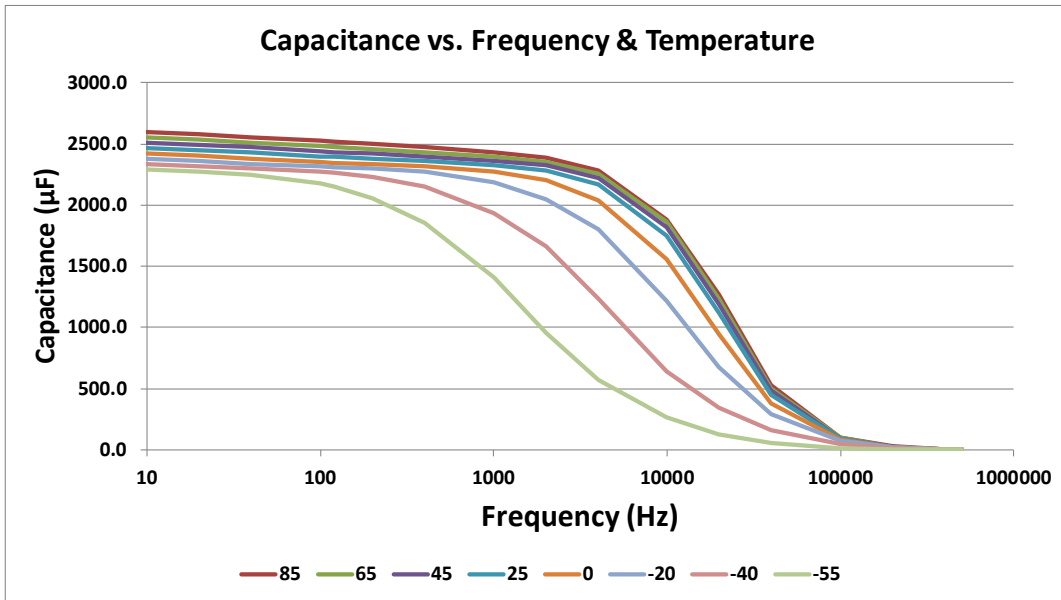
## Typical Performance Curves



# Type THA, Thinpack™, Aluminum Electrolytic Capacitor, 85 °C

## Typical Performance Curves

THA272M060AC0C



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