

# SMD Aluminum Electrolytic Capacitors

## AEH Series



### FEATURES

- Endurance: 125°C, 2000 to 5000 hours
- Designed for surface mounting on high density PC board
- RoHS Compliance
- AEC-Q200 Tested

### APPLICATIONS

- DC/DC Converters, for high density SMD boards and higher operation temperature environment applications

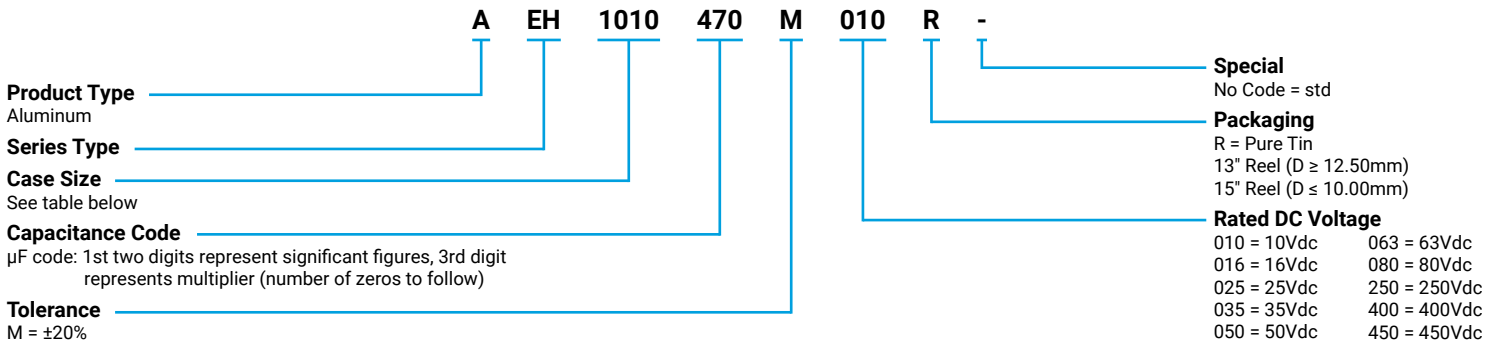


LEAD-FREE  
LEAD-FREE COMPATIBLE  
COMPONENT



RoHS  
COMPLIANT

### HOW TO ORDER



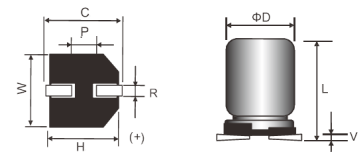
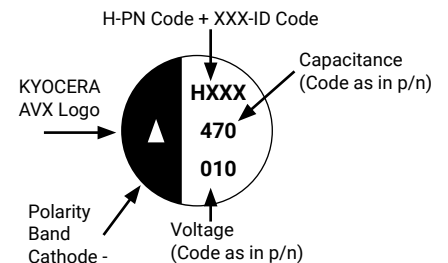
### CASE DIMENSIONS millimeters (inches)

| Code | D±0.50<br>(0.020) | L±0.50<br>(0.020) | W±0.20<br>(0.008) | H±0.20<br>(0.008) | C±0.20<br>(0.008) | R                              | P±0.30<br>(0.012) | V max           | Typical Weight (g) |
|------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------------------|-------------------|-----------------|--------------------|
| 0608 | 6.30<br>(0.248)   | 8.00<br>(0.315)   | 6.60<br>(0.260)   | 6.60<br>(0.260)   | 7.30<br>(0.287)   | 0.50 - 0.80<br>(0.020 - 0.031) | 2.00<br>(0.080)   | 0.30<br>(0.012) | 0.41               |
| 0810 | 8.00<br>(0.315)   | 10.50<br>(0.413)  | 8.30<br>(0.327)   | 8.30<br>(0.327)   | 9.00<br>(0.354)   | 0.70 - 1.10<br>(0.028 - 0.043) | 3.20<br>(0.126)   | 0.30<br>(0.012) | 0.85               |
| 0812 | 8.00<br>(0.315)   | 12.50<br>(0.492)  | 8.30<br>(0.327)   | 8.30<br>(0.327)   | 9.00<br>(0.354)   | 0.70 - 1.10<br>(0.028 - 0.043) | 3.20<br>(0.126)   | 0.30<br>(0.012) | 0.90               |
| 1010 | 10.00<br>(0.394)  | 10.50<br>(0.413)  | 10.30<br>(0.406)  | 10.30<br>(0.406)  | 11.00<br>(0.433)  | 0.70 - 1.30<br>(0.028 - 0.051) | 4.50<br>(0.177)   | 0.30<br>(0.012) | 1.14               |
| 1012 | 10.00<br>(0.394)  | 12.50<br>(0.492)  | 10.30<br>(0.406)  | 10.30<br>(0.406)  | 11.00<br>(0.433)  | 0.70 - 1.30<br>(0.028 - 0.051) | 4.50<br>(0.177)   | 0.30<br>(0.012) | 1.41               |
| 1013 | 10.00<br>(0.394)  | 13.50<br>(0.531)  | 10.30<br>(0.406)  | 10.30<br>(0.406)  | 11.00<br>(0.433)  | 0.70 - 1.30<br>(0.028 - 0.051) | 4.50<br>(0.177)   | 0.30<br>(0.012) | 1.40               |
| 1016 | 10.00<br>(0.394)  | 16.50<br>(0.650)  | 10.30<br>(0.406)  | 10.30<br>(0.406)  | 11.00<br>(0.433)  | 0.70 - 1.30<br>(0.028 - 0.051) | 4.50<br>(0.177)   | 0.30<br>(0.012) | 1.50               |
| 1213 | 12.50<br>(0.492)  | 13.50<br>(0.531)  | 13.00<br>(0.512)  | 13.00<br>(0.512)  | 13.70<br>(0.539)  | 1.10 - 1.40<br>(0.043 - 0.055) | 4.50<br>(0.177)   | 0.40<br>(0.016) | 2.70               |
| 1216 | 12.50<br>(0.492)  | 16.00<br>(0.630)  | 13.00<br>(0.512)  | 13.00<br>(0.512)  | 13.70<br>(0.539)  | 1.10 - 1.40<br>(0.043 - 0.055) | 4.50<br>(0.177)   | 0.40<br>(0.016) | 3.30               |

### TECHNICAL SPECIFICATIONS

|                             |                                                            |                                                              |  |                                                |
|-----------------------------|------------------------------------------------------------|--------------------------------------------------------------|--|------------------------------------------------|
| Category Temperature Range: | -55°C to + 125°C (10 - 80V), -40°C to + 125°C (250 - 450V) |                                                              |  |                                                |
| Capacitance Range           | At 25°C, 120Hz                                             | 2.2μF to 470μF                                               |  |                                                |
| Capacitance Tolerance:      | At 25°C, 120Hz                                             | ±20%                                                         |  |                                                |
| Dissipation Factor (%)      | Measurement Frequency: 120Hz at 25°C                       | Please see the ratings and part number reference table below |  |                                                |
| Leakage Current             | Rated voltage at 25°C                                      | 10 - 80V                                                     |  | 250 - 450V                                     |
|                             |                                                            | 0608 - 1013                                                  |  | 1213 - 1616                                    |
|                             |                                                            | I ≤ 0.01CV or 3μA, whichever is greater (2min)               |  | I ≤ 0.03CV or 4μA, whichever is greater (2min) |
|                             |                                                            |                                                              |  | I ≤ 0.04CV + 100μA (1minute)                   |

### MARKING



# SMD Aluminum Electrolytic Capacitors

## AEH Series



### CAPACITANCE AND RATED VOLTAGE RANGE (FIGURES DENOTES CASE SIZE)

| Capacitance |      | Rated Voltage DC (V <sub>R</sub> ) |            |      |      |            |      |      |      |      |      |
|-------------|------|------------------------------------|------------|------|------|------------|------|------|------|------|------|
| μF          | Code | 10V                                | 16V        | 25V  | 35V  | 50V        | 63V  | 80V  | 250V | 400V | 450V |
| 2.2         | 2R2  |                                    |            |      |      |            |      |      |      | 0810 | 0810 |
| 3.3         | 3R3  |                                    |            |      |      |            |      |      |      |      | 0812 |
| 4.7         | 4R7  |                                    |            |      |      |            |      |      | 1010 | 1010 | 1010 |
| 6.8         | 6R8  |                                    |            |      |      |            |      |      |      | 1013 |      |
| 10          | 100  |                                    |            |      |      | 0608       |      |      |      | 1016 |      |
| 22          | 220  |                                    |            |      |      | 0608       |      |      |      |      |      |
| 33          | 330  |                                    |            |      |      | 0608       |      |      |      |      |      |
| 47          | 470  |                                    |            | 0608 | 0608 | 0810       |      | 1010 |      |      |      |
| 100         | 101  | 0608                               | 0608, 0810 | 0810 | 0810 | 1010       | 1012 |      |      |      |      |
| 220         | 221  |                                    |            | 1010 | 1010 | 1012, 1213 |      |      |      |      |      |
| 330         | 331  |                                    |            | 1010 |      | 1216       |      |      |      |      |      |
| 470         | 471  | 1010                               | 1012       | 1213 | 1216 |            |      |      |      |      |      |

Released ratings

### RATINGS & PART NUMBER REFERENCE

| Part No.        | Case Size | Capacitance (μF) | Rated Voltage (V) | DF Max. (%) | 100kHz RMS Current (mA) |
|-----------------|-----------|------------------|-------------------|-------------|-------------------------|
| 10 Volt         |           |                  |                   |             |                         |
| AEH0608101M010R | 0608      | 100              | 10                | 24          | 110                     |
| AEH1010471M010R | 1010      | 470              | 10                | 24          | 296                     |
| 16 Volt         |           |                  |                   |             |                         |
| AEH0608101M016R | 0608      | 100              | 16                | 20          | 110                     |
| AEH0810101M016R | 0810      | 100              | 16                | 20          | 220                     |
| AEH1012471M016R | 1012      | 470              | 16                | 20          | 340                     |
| 25 Volt         |           |                  |                   |             |                         |
| AEH0608470M025R | 0608      | 47               | 25                | 16          | 110                     |
| AEH0810101M025R | 0810      | 100              | 25                | 16          | 220                     |
| AEH1010221M025R | 1010      | 220              | 25                | 16          | 296                     |
| AEH1010331M025R | 1010      | 330              | 25                | 16          | 296                     |
| AEH1213471M025R | 1213      | 470              | 25                | 16          | 750                     |
| 35 Volt         |           |                  |                   |             |                         |
| AEH0608470M035R | 0608      | 47               | 35                | 14          | 110                     |
| AEH0810101M035R | 0810      | 100              | 35                | 14          | 220                     |
| AEH1010221M035R | 1010      | 220              | 35                | 14          | 296                     |
| AEH1216471M035R | 1216      | 470              | 35                | 14          | 900                     |
| 50 Volt         |           |                  |                   |             |                         |
| AEH0608100M050R | 0608      | 10               | 50                | 14          | 83                      |
| AEH0608220M050R | 0608      | 22               | 50                | 14          | 83                      |
| AEH0608330M050R | 0608      | 33               | 50                | 14          | 83                      |
| AEH0810470M050R | 0810      | 47               | 50                | 14          | 160                     |
| AEH1010101M050R | 1010      | 100              | 50                | 14          | 247                     |
| AEH1012221M050R | 1012      | 220              | 50                | 14          | 350                     |
| AEH1213221M050R | 1213      | 220              | 50                | 14          | 550                     |
| AEH1216331M050R | 1216      | 330              | 50                | 14          | 700                     |
| 63 Volt         |           |                  |                   |             |                         |
| AEH1012101M063R | 1012      | 100              | 63                | 12          | 270                     |
| 80 Volt         |           |                  |                   |             |                         |
| AEH1010470M080R | 1010      | 47               | 80                | 12          | 245                     |
| 250 Volt        |           |                  |                   |             |                         |
| AEH10104R7M250R | 1010      | 4.7              | 250               | 24          | 59                      |
| 400 Volt        |           |                  |                   |             |                         |
| AEH08102R2M400R | 0810      | 2.2              | 400               | 30          | 30                      |
| AEH10104R7M400R | 1010      | 4.7              | 400               | 30          | 65                      |
| AEH10136R8M400R | 1013      | 6.8              | 400               | 30          | 90                      |
| AEH1016100M400R | 1016      | 10               | 400               | 30          | 102                     |
| 450 Volt        |           |                  |                   |             |                         |
| AEH08102R2M450R | 0810      | 2.2              | 450               | 30          | 30                      |
| AEH08123R3M450R | 0812      | 3.3              | 450               | 30          | 32                      |
| AEH10104R7M450R | 1010      | 4.7              | 450               | 30          | 40                      |

All technical data relates to an ambient temperature of +25°C. Capacitance and DF are measured at 120Hz, 0.5RMS with DC bias of 2.2 volts. DCL is measured at rated voltage after 5 minutes.



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at [www.kyocera-avx.com/disclaimer/](http://www.kyocera-avx.com/disclaimer/) by reference and should be reviewed in full before placing any order.

TDS-ALUM-0002 | Rev 5

— ALUMINUM CAPACITORS —

# SMD Aluminum Electrolytic Capacitors

## AEH Series

### FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

| Rated Voltage (Vdc) | Capacitance (μF) | 120 - 1K (Hz) | 1K - 10K (Hz) | 10K - 100K (Hz) | 100K(Hz) |
|---------------------|------------------|---------------|---------------|-----------------|----------|
| 10 - 80             | Cap. < 220       | 0.40          | 0.75          | 0.90            | 1.00     |
|                     | 220 ≤ Cap. < 470 | 0.50          | 0.85          | 0.94            | 1.00     |
| 250 - 450           | Cap. ≤ 33        | 0.55          | 0.83          | 0.97            | 1.00     |
|                     | Cap. > 33        | 0.66          | 0.86          | 0.93            | 1.00     |

Internal heating produced by ripple current will reduce the lifetime of capacitors, at a rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use the rms ripple current should be minimized.

### REFLOW

| Diameter (mm)               | Φ6.3                          | Φ8           | Φ10          | Φ12.5                         |
|-----------------------------|-------------------------------|--------------|--------------|-------------------------------|
| Peak Temperature            | 260°C, 5 sec. max.            |              |              |                               |
| Preheat Temperature         | 100°C to 200°C, 180 sec. max. |              |              | 100°C to 180°C, 150 sec. max. |
| Duration at 200°C or higher | 90 sec. max.                  | 90 sec. max. | 60 sec. max. | 60 sec. max.                  |
| Duration at 230°C or higher | 40 sec. max.                  | 30 sec. max. | 30 sec. max. | 30 sec. max.                  |
| Reflow Number               | Twice* or less                |              |              |                               |

\*if twice then need to be at least 2hrs between reflows

### QUALIFICATION TABLE

| Test                                                      | AEH series (-55°C to + 125°C (10 - 80V), -40°C to + 125°C (250 - 450V))                                                                                                                                                                                                                      |                   |                   |                                       |    |    |    |    |    |    |             |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|---------------------------------------|----|----|----|----|----|----|-------------|
|                                                           | Condition                                                                                                                                                                                                                                                                                    | Characteristics   |                   |                                       |    |    |    |    |    |    |             |
| Low Temperature Characteristics<br>(Max. Impedance Ratio) | At 120Hz                                                                                                                                                                                                                                                                                     | Rated Voltage (V) |                   | 10                                    | 16 | 25 | 35 | 50 | 63 | 80 | 250 400-450 |
|                                                           |                                                                                                                                                                                                                                                                                              | 0608-1016         | Z(-25°C)/Z(+20°C) | 3                                     | 2  | 2  | 2  | 2  | 2  | 2  | 6           |
|                                                           |                                                                                                                                                                                                                                                                                              |                   | Z(-40°C)/Z(+20°C) | 6                                     | 4  | 4  | 3  | 3  | 3  | 3  | 10 18       |
|                                                           |                                                                                                                                                                                                                                                                                              | 1213-1216         | Z(-25°C)/Z(+20°C) | 4                                     | 3  | 2  | 2  | 2  | 2  | 2  | 6 6         |
| Endurance                                                 | The specifications shall be met when the capacitors are restored to 20°C after rated voltage is applied for a specified period of time at 125°C.<br>Load life: 0608 (10-50V) 1000 hours<br>0810-1016 (10-80V) 2000 hours<br>1213-1216 (10-80V) 5000 hours<br>0810-1216 (250-450V) 3000 hours | ΔC/C              |                   | ≤ ±30% of the initial limit           |    |    |    |    |    |    |             |
|                                                           |                                                                                                                                                                                                                                                                                              | DF                |                   | ≤ 300% of the initial specified limit |    |    |    |    |    |    |             |
|                                                           |                                                                                                                                                                                                                                                                                              | DCL               |                   | ≤ Initial specified limit             |    |    |    |    |    |    |             |
|                                                           |                                                                                                                                                                                                                                                                                              | ΔC/C              |                   | ≤ ±30% of the initial limit           |    |    |    |    |    |    |             |
| Shelf Life                                                | The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 125°C for 1,000 hours (450V: 500 hours)                                                                                                                         | DF                |                   | ≤ 300% of the initial specified limit |    |    |    |    |    |    |             |
|                                                           |                                                                                                                                                                                                                                                                                              | DCL               |                   | ≤ 500% of the initial specified limit |    |    |    |    |    |    |             |
|                                                           |                                                                                                                                                                                                                                                                                              |                   |                   |                                       |    |    |    |    |    |    |             |

### STORAGE

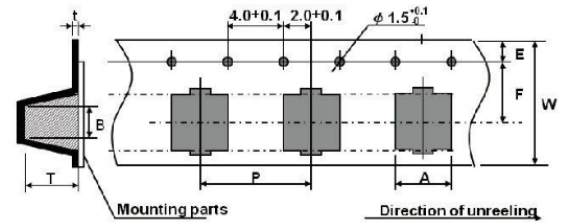
- It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C (If between 35 to 85°C, it should be less than three months), and the relative humidity of 75% or below.
- Confirm that the environment does not have any of the following conditions:
  - Damp conditions such as water, saltwater spray, or oil spray or fumes. High humidity or humidity condensation situations.
  - In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
  - Being exposed to direct sunlight, ozone, ultraviolet ray, or radiation.
  - Being exposed to acidic or alkaline solutions.
  - Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specification.
- Storage time:
  - Before unseal: within 2 years after delivery

# SMD Aluminum Electrolytic Capacitors

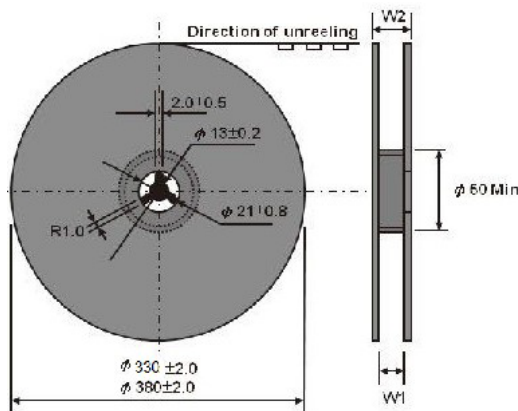
## AEH Series

### PACKAGE TAPE DIMENSIONS units (mm)

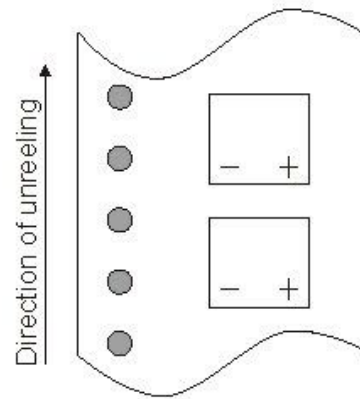
| Size Code | A±0.20 | B±0.20 | W±0.30 | F±0.10 | E±0.10 | P±0.10 | t±0.10 | T±0.20      |
|-----------|--------|--------|--------|--------|--------|--------|--------|-------------|
| 0608      | 7.0    | 7.0    | 16.0   | 7.5    | 1.75   | 12.0   | 0.4    | 8.0         |
| 0810      | 8.7    | 8.7    | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 11.0        |
| 0812      | 8.7    | 8.7    | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 13.0        |
| 1010      | 10.7   | 10.7   | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 11.0        |
| 1012      | 10.7   | 10.7   | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 13.0 - 13.5 |
| 1013      | 10.7   | 10.7   | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 15.0        |
| 1016      | 10.7   | 10.7   | 24.0   | 11.5   | 1.75   | 16.0   | 0.4    | 17.5        |
| 1213      | 13.4   | 13.4   | 32.0   | 14.2   | 1.75   | 24.0   | 0.4    | 14.5        |
| 1216      | 13.4   | 13.4   | 32.0   | 14.2   | 1.75   | 24.0   | 0.4    | 16.5        |



### REEL



### POLARITY



### DIMENSIONS units (mm)

| Size Code | W1±1.00 | W2±1.00 | Qty./Reel | Reel Size (inches) |
|-----------|---------|---------|-----------|--------------------|
| 0608      | 18.0    | 22.0    | 1000      | 15                 |
| 0810      | 18.0    | 22.0    | 550       | 15                 |
| 0812      | 26.0    | 31.0    | 550       | 15                 |
| 1010      | 26.0    | 31.0    | 550       | 15                 |
| 1012      | 26.0    | 31.0    | 500       | 15                 |
| 1013      | 26.0    | 31.0    | 450       | 15                 |
| 1016      | 26.0    | 31.0    | 350       | 15                 |
| 1213      | 34.0    | 39.0    | 200       | 13                 |
| 1216      | 34.0    | 39.0    | 150       | 13                 |

### RECOMMENDED LAND PATTERN DIMENSION OF PCB

| Size Code | A (mm) | B (mm) | C (mm) |
|-----------|--------|--------|--------|
| 0608      | 1.9    | 3.5    | 1.6    |
| 0810      | 3.1    | 4.2    | 2.2    |
| 0812      | 3.1    | 4.2    | 2.2    |
| 1010      | 4.5    | 4.4    | 2.2    |
| 1012      | 4.5    | 4.4    | 2.2    |
| 1013      | 4.5    | 4.4    | 2.2    |
| 1016      | 4.5    | 4.4    | 2.2    |
| 1213      | 4.0    | 5.7    | 2.5    |
| 1216      | 4.0    | 5.7    | 2.5    |

