



## Alchip™-MHB Series

- ESR : Less than MVH
- Endurance : 1,500 to 3,000 hours at 125°C
- Rated voltage range : 10 to 100V
- Solvent resistant type (see PRECAUTIONS AND GUIDELINES)
- Vibration resistant structure
- RoHS2 Compliant
- AEC-Q200 compliant : Please contact Chemi-Con for more details, test data, information.

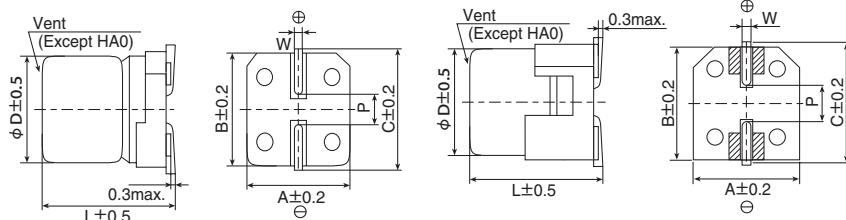
### ◆SPECIFICATIONS

| Items                                                  | Characteristics                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------|------|------|------|------|------|------|--|
| Category                                               | -40 to +125℃                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Temperature Range                                      |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Rated Voltage Range                                    | 10 to 100V <sub>dc</sub>                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Capacitance Tolerance                                  | ± 20%(M) (at 20℃, 120Hz)                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Leakage Current                                        | HA0 & JA0                                                                                                                                                                                                                                                                             | I=0.01CV                                                                                                                                                                                                                                                       |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        | KE0 to MN0                                                                                                                                                                                                                                                                            | I=0.03CV                                                                                                                                                                                                                                                       |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        | Where, I : Max. leakage current (μA), C : Nominal capacitance (μF), V : Rated voltage (V) (at 20℃ after 2 minutes)                                                                                                                                                                    |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Dissipation Factor (tan δ)                             | Rated Voltage (V <sub>dc</sub> )                                                                                                                                                                                                                                                      | 10V                                                                                                                                                                                                                                                            | 16V                                                                              | 25V  | 35V  | 50V  | 63V  | 80V  | 100V |      |  |
|                                                        | tan δ (Max.)                                                                                                                                                                                                                                                                          | HA0 & JA0                                                                                                                                                                                                                                                      | 0.24                                                                             | 0.20 | 0.16 | 0.14 | —    | —    | —    | —    |  |
|                                                        |                                                                                                                                                                                                                                                                                       | KE0 to MN0                                                                                                                                                                                                                                                     | —                                                                                | —    | 0.14 | 0.12 | 0.10 | 0.10 | 0.08 | 0.08 |  |
|                                                        | When nominal capacitance exceeds 1,000μF, add 0.02 to the value above for each 1,000μF increase. (at 20℃, 120Hz)                                                                                                                                                                      |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Low Temperature Characteristics (Max. impedance Ratio) | Rated Voltage (V <sub>dc</sub> )                                                                                                                                                                                                                                                      | 10V                                                                                                                                                                                                                                                            | 16V                                                                              | 25V  | 35V  | 50V  | 63V  | 80V  | 100V |      |  |
|                                                        | HA0 & JA0                                                                                                                                                                                                                                                                             | Z(-25℃)/Z(+20℃)                                                                                                                                                                                                                                                | 3                                                                                | 2    | 2    | 2    | —    | —    | —    | —    |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Z(-40℃)/Z(+20℃)                                                                                                                                                                                                                                                | 4                                                                                | 3    | 3    | 3    | —    | —    | —    | —    |  |
|                                                        | KE0 to MN0                                                                                                                                                                                                                                                                            | Z(-25℃)/Z(+20℃)                                                                                                                                                                                                                                                | —                                                                                | —    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Z(-40℃)/Z(+20℃)                                                                                                                                                                                                                                                | —                                                                                | —    | 4    | 4    | 4    | 4    | 4    | 4    |  |
| (at 120Hz)                                             |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Endurance                                              | HA0 & JA0                                                                                                                                                                                                                                                                             | The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 125℃.                                                                                                            |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Capacitance change                                                                                                                                                                                                                                             | ≤ ± 30% of the initial value                                                     |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | D.F. (tan δ )                                                                                                                                                                                                                                                  | ≤ 300% of the initial specified value                                            |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Leakage current                                                                                                                                                                                                                                                | ≤ The initial specified value                                                    |      |      |      |      |      |      |      |  |
|                                                        | KE0 to MN0                                                                                                                                                                                                                                                                            | The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjected to DC voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for the specified period of time at 125℃. |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Time                                                                                                                                                                                                                                                           | KE0 & KG5 : 1,500hours<br>LH0 & MH0 : 2,000hours<br>KN0 & LN0 & MN0 : 3,000hours |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Capacitance change                                                                                                                                                                                                                                             | ≤ ± 30% of the initial value                                                     |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | D.F. (tan δ )                                                                                                                                                                                                                                                  | ≤ 300% of the initial specified value                                            |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       | Leakage current                                                                                                                                                                                                                                                | ≤ The initial specified value                                                    |      |      |      |      |      |      |      |  |
|                                                        |                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
| Shelf Life                                             | The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. Before the measurement, the capacitor shall be preconditioned by applying voltage according to Item 4.1 of JIS C 5101-4. |                                                                                                                                                                                                                                                                |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        | Capacitance change                                                                                                                                                                                                                                                                    | ≤ ± 30% of the initial value                                                                                                                                                                                                                                   |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        | D.F. (tan δ )                                                                                                                                                                                                                                                                         | ≤ 300% of the initial specified value                                                                                                                                                                                                                          |                                                                                  |      |      |      |      |      |      |      |  |
|                                                        | Leakage current                                                                                                                                                                                                                                                                       | ≤ The initial specified value                                                                                                                                                                                                                                  |                                                                                  |      |      |      |      |      |      |      |  |

### ◆DIMENSIONS [mm]

- Terminal Code : A
- Size code : HA0 to MN0

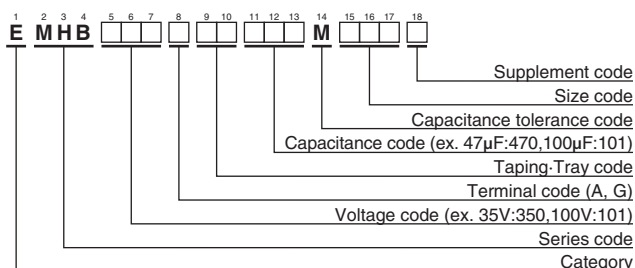
- Terminal Code : G(Vibration resistant structure)
- Size code : HA0 to MN0



| Size code | φD   | L    | A    | B    | C    | W          | P   |
|-----------|------|------|------|------|------|------------|-----|
| HA0       | 8    | 10.0 | 8.3  | 8.3  | 9.0  | 0.7 to 1.1 | 3.1 |
| JA0       | 10   | 10.0 | 10.3 | 10.3 | 11.0 | 0.7 to 1.1 | 4.5 |
| KE0       | 12.5 | 13.5 | 13.0 | 13.0 | 13.7 | 1.0 to 1.3 | 4.2 |
| KG5       | 12.5 | 16.0 | 13.0 | 13.0 | 13.7 | 1.0 to 1.3 | 4.2 |
| KN0       | 12.5 | 21.5 | 13.0 | 13.0 | 13.7 | 1.0 to 1.3 | 4.2 |
| LH0       | 16   | 16.5 | 17.0 | 17.0 | 18.0 | 1.0 to 1.3 | 6.5 |
| LN0       | 16   | 21.5 | 17.0 | 17.0 | 18.0 | 1.0 to 1.3 | 6.5 |
| MH0       | 18   | 16.5 | 19.0 | 19.0 | 20.0 | 1.0 to 1.3 | 6.5 |
| MN0       | 18   | 21.5 | 19.0 | 19.0 | 20.0 | 1.0 to 1.3 | 6.5 |

▨ : Supportive terminals

### ◆PART NUMBERING SYSTEM



Please refer to "Product code guide (surface mount type)"

### ◆MARKING



- Rated voltage symbol (HA0, JA0)

| Rated voltage (V <sub>dc</sub> ) | 10 | 16 | 25 | 35 |
|----------------------------------|----|----|----|----|
| Symbol                           | A  | C  | E  | V  |



## ◆STANDARD RATINGS

| WV<br>(V <sub>dc</sub> ) | Cap<br>(μF) | Size<br>code | ESR(Initial)<br>(Ω max./100k to 400kHz) |        | ESR(End of life)<br>(Ω max.) |       |        | Rated ripple current<br>(mArms/125°C,<br>100k to 400kHz) | Part No.               |
|--------------------------|-------------|--------------|-----------------------------------------|--------|------------------------------|-------|--------|----------------------------------------------------------|------------------------|
|                          |             |              | 20°C                                    | -40°C  | 100kHz                       |       | 400kHz |                                                          |                        |
|                          |             |              |                                         |        | 20°C                         | -40°C | -40°C  |                                                          |                        |
| 10                       | 330         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB100 □ RA331MHA0G   |
|                          | 470         | JA0          | 0.2                                     | 2.0    | —                            | —     | 4.5    | 330                                                      | EMHB100 □ RA471MJA0G   |
| 16                       | 100         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB160 □ RA101MHA0G   |
|                          | 220         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB160 □ RA221MHA0G   |
| 25                       | 100         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB250 □ RA101MHA0G   |
|                          | 220         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB250 □ RA221MHA0G   |
|                          | 330         | JA0          | 0.2                                     | 2.0    | —                            | —     | 4.5    | 330                                                      | EMHB250 □ RA331MJA0G   |
|                          | 820         | KE0          | 0.060                                   | 0.30   | 0.30                         | 3.7   | —      | 1,320                                                    | EMHB250 □ RA821MKE0S   |
|                          | 1,100       | KG5          | 0.056                                   | 0.28   | 0.28                         | 3.4   | —      | 1,470                                                    | EMHB250 □ RA112MKG5S   |
|                          | (1,500)     | (KN0)        | (0.044)                                 | (0.22) | (0.18)                       | (2.2) | —      | (1,620)                                                  | (EMHB250 □ TR152MKN0S) |
|                          | 1,600       | LH0          | 0.047                                   | 0.24   | 0.24                         | 2.9   | —      | 1,820                                                    | EMHB250 □ RA162MLH0S   |
|                          | 2,200       | MH0          | 0.045                                   | 0.23   | 0.23                         | 2.8   | —      | 2,000                                                    | EMHB250 □ RA222MMH0S   |
|                          | 2,700       | LN0          | 0.034                                   | 0.17   | 0.10                         | 1.3   | —      | 2,280                                                    | EMHB250 □ RA272MLN0S   |
| 35                       | 3,300       | MN0          | 0.032                                   | 0.16   | 0.090                        | 0.60  | —      | 2,490                                                    | EMHB250 □ RA332MMN0S   |
|                          | 47          | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB350 □ RA470MHA0G   |
|                          | 100         | HA0          | 0.3                                     | 3.0    | —                            | —     | 6.0    | 240                                                      | EMHB350 □ RA101MHA0G   |
|                          | 100         | JA0          | 0.2                                     | 2.0    | —                            | —     | 4.5    | 330                                                      | EMHB350 □ RA101MJA0G   |
|                          | 220         | JA0          | 0.2                                     | 2.0    | —                            | —     | 4.5    | 330                                                      | EMHB350 □ RA221MJA0G   |
|                          | 560         | KE0          | 0.060                                   | 0.30   | 0.30                         | 3.7   | —      | 1,320                                                    | EMHB350 □ RA561MKE0S   |
|                          | 680         | KG5          | 0.056                                   | 0.28   | 0.28                         | 3.4   | —      | 1,470                                                    | EMHB350 □ RA681MKG5S   |
|                          | (910)       | (KN0)        | (0.044)                                 | (0.22) | (0.18)                       | (2.2) | —      | (1,620)                                                  | (EMHB350 □ TR911MKN0S) |
|                          | 1,000       | LH0          | 0.047                                   | 0.24   | 0.24                         | 2.9   | —      | 1,820                                                    | EMHB350 □ RA102MLH0S   |
| 50                       | 1,300       | MH0          | 0.045                                   | 0.23   | 0.23                         | 2.8   | —      | 2,000                                                    | EMHB350 □ RA132MMH0S   |
|                          | 1,600       | LN0          | 0.034                                   | 0.17   | 0.10                         | 1.3   | —      | 2,280                                                    | EMHB350 □ RA162MLN0S   |
|                          | 2,200       | MN0          | 0.032                                   | 0.16   | 0.090                        | 0.60  | —      | 2,490                                                    | EMHB350 □ RA222MMN0S   |
|                          | 270         | KE0          | 0.11                                    | 0.55   | 0.55                         | 6.6   | —      | 980                                                      | EMHB500 □ RA271MKE0S   |
|                          | 360         | KG5          | 0.10                                    | 0.50   | 0.50                         | 6.0   | —      | 1,090                                                    | EMHB500 □ RA361MKG5S   |
|                          | (470)       | (KN0)        | (0.076)                                 | (0.38) | (0.38)                       | (4.6) | —      | (1,200)                                                  | (EMHB500 □ TR471MKN0S) |
| 63                       | 510         | LH0          | 0.087                                   | 0.44   | 0.44                         | 5.2   | —      | 1,320                                                    | EMHB500 □ RA511MLH0S   |
|                          | 680         | MH0          | 0.087                                   | 0.44   | 0.44                         | 5.2   | —      | 1,420                                                    | EMHB500 □ RA681MMH0S   |
|                          | 820         | LN0          | 0.050                                   | 0.25   | 0.25                         | 3.0   | —      | 2,040                                                    | EMHB500 □ RA821MLN0S   |
|                          | 1,100       | MN0          | 0.050                                   | 0.25   | 0.25                         | 3.0   | —      | 2,240                                                    | EMHB500 □ RA112MMN0S   |
|                          | 200         | KE0          | 0.22                                    | 1.54   | 0.88                         | 14    | —      | 540                                                      | EMHB630 □ RA201MKE0S   |
|                          | 270         | KG5          | 0.17                                    | 1.19   | 0.68                         | 11    | —      | 650                                                      | EMHB630 □ RA271MKG5S   |
| 80                       | (330)       | (KN0)        | (0.13)                                  | (0.94) | (0.53)                       | (8.5) | —      | (830)                                                    | (EMHB630 □ TR331MKN0S) |
|                          | 360         | LH0          | 0.15                                    | 1.05   | 0.60                         | 9.6   | —      | 780                                                      | EMHB630 □ RA361MLH0S   |
|                          | 470         | MH0          | 0.12                                    | 0.84   | 0.48                         | 7.7   | —      | 940                                                      | EMHB630 □ RA471MMH0S   |
|                          | 560         | LN0          | 0.085                                   | 0.58   | 0.19                         | 3.0   | —      | 1,790                                                    | EMHB630 □ RA561MLN0S   |
|                          | 750         | MN0          | 0.070                                   | 0.49   | 0.19                         | 3.0   | —      | 1,910                                                    | EMHB630 □ RA751MMN0S   |
|                          | 130         | KE0          | 0.22                                    | 1.54   | 0.88                         | 14    | —      | 540                                                      | EMHB800 □ RA131MKE0S   |
| 100                      | 160         | KG5          | 0.17                                    | 1.19   | 0.68                         | 11    | —      | 650                                                      | EMHB800 □ RA161MKG5S   |
|                          | (220)       | (KN0)        | (0.13)                                  | (0.94) | (0.53)                       | (8.5) | —      | (830)                                                    | (EMHB800 □ TR221MKN0S) |
|                          | 240         | LH0          | 0.15                                    | 1.05   | 0.60                         | 9.6   | —      | 780                                                      | EMHB800 □ RA241MLH0S   |
|                          | 330         | MH0          | 0.12                                    | 0.84   | 0.48                         | 7.7   | —      | 940                                                      | EMHB800 □ RA331MMH0S   |
|                          | 390         | LN0          | 0.085                                   | 0.58   | 0.19                         | 3.0   | —      | 1,790                                                    | EMHB800 □ RA391MLN0S   |
|                          | 510         | MN0          | 0.070                                   | 0.49   | 0.19                         | 3.0   | —      | 1,910                                                    | EMHB800 □ RA511MMN0S   |
| 100                      | 75          | KE0          | 0.28                                    | 2.24   | 1.1                          | 22    | —      | 480                                                      | EMHB101 □ RA750MKE0S   |
|                          | 100         | KG5          | 0.21                                    | 1.68   | 0.84                         | 17    | —      | 580                                                      | EMHB101 □ RA101MKG5S   |
|                          | (130)       | (KN0)        | (0.17)                                  | (1.32) | (0.66)                       | (13)  | —      | (740)                                                    | (EMHB101 □ TR131MKN0S) |
|                          | 130         | LH0          | 0.18                                    | 1.44   | 0.72                         | 14    | —      | 720                                                      | EMHB101 □ RA131MLH0S   |
|                          | 180         | MH0          | 0.15                                    | 1.20   | 0.60                         | 12    | —      | 840                                                      | EMHB101 □ RA181MMH0S   |
|                          | 220         | LN0          | 0.11                                    | 0.88   | 0.25                         | 3.9   | —      | 1,580                                                    | EMHB101 □ RA221MLN0S   |
|                          | 300         | MN0          | 0.091                                   | 0.73   | 0.22                         | 3.9   | —      | 1,690                                                    | EMHB101 □ RA301MMN0S   |

□ : Enter the appropriate terminal code.

() : Second standard

## ◆RATED RIPPLE CURRENT MULTIPLIERS

## ● Frequency Multipliers

| Size code  | Capacitance(μF) | Frequency(Hz) | 120  | 1k   | 10k  | 100k |
|------------|-----------------|---------------|------|------|------|------|
| HA0 to JA0 | 47 to 470       |               | 0.93 | 0.97 | 1.00 | 1.00 |
|            | 75 to 200       |               | 0.40 | 0.75 | 0.90 | 1.00 |
| KE0 to MN0 | 220 to 560      |               | 0.50 | 0.85 | 0.94 | 1.00 |
|            | 680 to 1,600    |               | 0.60 | 0.87 | 0.95 | 1.00 |
|            | 2,200 to 3,300  |               | 0.75 | 0.90 | 0.95 | 1.00 |
|            |                 |               |      |      |      |      |

The deterioration of aluminum electrolytic capacitors accelerates their life due to the internal heating produced by ripple current. For details, refer to Section "5-3 Ripple Current Effect on Lifetime" in the catalog, Technical Note.

Product specifications in this catalog are subject to change without notice. Request our product specifications before purchase and/or use. Please use our products based on the information contained in this catalog and product specifications.



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[Part Numbering System](#)

[Part Numbering System \(Appendix\)](#)

[Standardization](#)

[Available Items by Manufacturing Locations](#)

[Environmental Measures](#)

[Technical Note](#)

[Precautions and Guidelines](#)

[Recommended Soldering Conditions](#)

[Taping, Lead-preforming and Packaging](#)

[Available Terminals for Snap-in and Screw Mount Type](#)