

# Radial Leaded Aluminum Hybrid Electrolytic Capacitors

## RHA Series



### FEATURES

- Low ESR
- Endurance: 105°C, 5000-10,000 hours
- RoHS Compliance and Halogen-free

### APPLICATIONS

- High Reliability applications
- Base station equipment

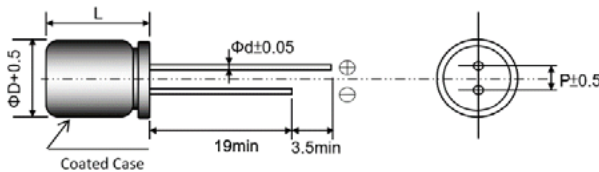


### HOW TO ORDER

|                                                                                                                                               |          |           |             |            |          |            |          |          |                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|-------------|------------|----------|------------|----------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                               | <b>R</b> | <b>HA</b> | <b>1009</b> | <b>471</b> | <b>M</b> | <b>016</b> | <b>K</b> | <b>-</b> |                                                                                                                                                      |
| <b>Product Type</b><br>Aluminum                                                                                                               |          |           |             |            |          |            |          |          | <b>Lead Type</b><br>" " empty = Standard long lead<br>"C" = Lead cut only<br>"D" = Lead cut and crimp<br>"F" = Lead cut and form                     |
| <b>Series Type</b><br>See table below                                                                                                         |          |           |             |            |          |            |          |          | <b>Packaging</b><br>K = Ammo Pack<br>B = Bulk Pack                                                                                                   |
| <b>Case Size</b><br>See table below                                                                                                           |          |           |             |            |          |            |          |          | <b>Rated DC Voltage</b><br>016 = 16Vdc 063 = 63Vdc<br>025 = 25Vdc 080 = 80Vdc<br>035 = 35Vdc 100 = 100Vdc<br>040 = 40Vdc 125 = 125Vdc<br>050 = 50Vdc |
| <b>Capacitance Code</b><br>µF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow) |          |           |             |            |          |            |          |          |                                                                                                                                                      |
| <b>Tolerance</b><br>M = ±20%                                                                                                                  |          |           |             |            |          |            |          |          |                                                                                                                                                      |
|                                                                                                                                               |          |           |             |            |          |            |          |          | "H" = Lead cut, crimp and form<br>"B" = Forming only<br>"L" = Lead cut and bend (Left)<br>"Z" = Lead cut and bend (Right)                            |

### CASE DIMENSIONS millimeters (inches)

| Code | D±0.50 (0.020) | L±1.50 (0.060) | d±0.05 (0.002) | P±0.50 (0.020) | Typical Weight (g) |
|------|----------------|----------------|----------------|----------------|--------------------|
| 0607 | 6.30 (0.248)   | 7.20 (0.283)   | 0.50 (0.020)   | 2.50 (0.098)   | 0.45               |
| 0809 | 8.00 (0.315)   | 9.50 (0.374)   | 0.60 (0.024)   | 3.50 (0.138)   | 0.87               |
| 1009 | 10.00 (0.394)  | 9.50 (0.374)   | 0.60 (0.024)   | 5.00 (0.197)   | 1.34               |
| 1011 | 10.00 (0.394)  | 11.50 (0.453)  | 0.60 (0.024)   | 5.00 (0.197)   | 1.47               |

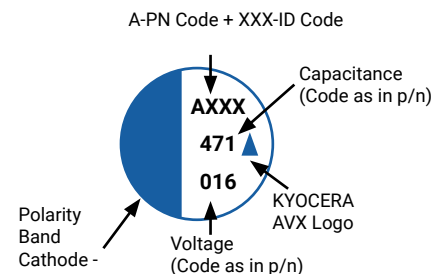


### TECHNICAL SPECIFICATIONS

|                                    |                                                   |                                                              |
|------------------------------------|---------------------------------------------------|--------------------------------------------------------------|
| <b>Category Temperature Range:</b> | -55°C to +105°C                                   |                                                              |
| <b>Capacitance Range</b>           | At 25°C, 120Hz                                    | 10µF to 560µF                                                |
| <b>Capacitance Tolerance:</b>      | At 25°C, 120Hz                                    | ±20%                                                         |
| <b>Surge Voltage:</b>              | at 15 - 35°C                                      | Rated voltage x 1.15                                         |
| <b>Dissipation Factor (%)</b>      | Measurement Frequency: 120Hz at 25°C              | Please see the ratings and part number reference table below |
| <b>Leakage Current:</b>            | After 2 minutes at rated working voltage at 25°C* | I ≤ 0.01CV or 3µA, whichever is greater                      |

\* Note: In the case of an anomalous reading, re-measure the leakage current after following voltage treatment:  
Voltage treatment: DC rated voltage to be applied to the capacitors for 120 minutes at 105°C.

### MARKING



# Radial Leaded Aluminum Hybrid Electrolytic Capacitors

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

| Capacitance |      | Rated Voltage DC (V <sub>R</sub> ) |      |      |      |      |            |      |      |      |
|-------------|------|------------------------------------|------|------|------|------|------------|------|------|------|
| μF          | Code | 16V                                | 25V  | 35V  | 40V  | 50V  | 63V        | 80V  | 100V | 125V |
| 10          | 100  |                                    |      |      |      |      | 0607       |      | 1009 | 1009 |
| 12          | 120  |                                    |      |      |      |      |            | 1009 | 1009 |      |
| 15          | 150  |                                    |      |      |      | 0607 |            | 1009 | 1011 |      |
| 18          | 180  |                                    |      |      |      |      |            | 1011 |      |      |
| 22          | 220  |                                    |      |      |      |      | 0809       |      |      |      |
| 27          | 270  |                                    |      |      | 0607 |      |            |      |      |      |
| 33          | 330  |                                    |      |      |      | 0809 | 0809, 1009 |      |      |      |
| 47          | 470  |                                    |      | 0607 |      |      | 1009       |      |      |      |
| 56          | 560  |                                    |      |      | 0809 | 1009 | 1011       |      |      |      |
| 68          | 680  |                                    | 0607 |      |      |      |            |      |      |      |
| 82          | 820  |                                    |      |      |      | 1011 |            |      |      |      |
| 100         | 101  |                                    | 0607 | 0809 | 1009 |      |            |      |      |      |
| 120         | 121  | 0607                               |      |      | 1011 |      |            |      |      |      |
| 150         | 151  |                                    | 0809 | 1009 |      |      |            |      |      |      |
| 220         | 221  |                                    |      | 1011 |      |      |            |      |      |      |
| 270         | 271  | 0809                               | 1009 |      |      |      |            |      |      |      |
| 330         | 331  |                                    | 1011 |      |      |      |            |      |      |      |
| 470         | 471  | 1009                               |      |      |      |      |            |      |      |      |
| 560         | 561  | 1011                               |      |      |      |      |            |      |      |      |

Released ratings

### RATINGS & PART NUMBER REFERENCE

| Part No.        | Case Size | Capacitance (μF) | Rated Voltage (V) | DCL Max. (μA) | DF Max. (%) | ESR Max. @100kHz (mΩ) | 100kHz RMS Current (mA) |
|-----------------|-----------|------------------|-------------------|---------------|-------------|-----------------------|-------------------------|
| 16 Volt         |           |                  |                   |               |             |                       |                         |
| RHA0607121M016* | 0607      | 120              | 16                | 19            | 16          | 40                    | 1500                    |
| RHA0809271M016* | 0809      | 270              | 16                | 43            | 16          | 26                    | 2000                    |
| RHA1009471M016* | 1009      | 470              | 16                | 75            | 16          | 21                    | 2600                    |
| RHA1011561M016* | 1011      | 560              | 16                | 90            | 16          | 15                    | 3000                    |
| 25 Volt         |           |                  |                   |               |             |                       |                         |
| RHA0607680M025* | 0607      | 68               | 25                | 17            | 16          | 45                    | 1400                    |
| RHA0607101M025* | 0607      | 100              | 25                | 25            | 16          | 45                    | 1400                    |
| RHA0809151M025* | 0809      | 150              | 25                | 38            | 16          | 27                    | 1900                    |
| RHA1009271M025* | 1009      | 270              | 25                | 68            | 16          | 22                    | 2500                    |
| RHA1011331M025* | 1011      | 330              | 25                | 83            | 16          | 16                    | 2900                    |
| 35 Volt         |           |                  |                   |               |             |                       |                         |
| RHA0607470M035* | 0607      | 47               | 35                | 16            | 16          | 60                    | 1300                    |
| RHA0809101M035* | 0809      | 100              | 35                | 35            | 16          | 30                    | 1800                    |
| RHA1009151M035* | 1009      | 150              | 35                | 53            | 16          | 23                    | 2400                    |
| RHA1011221M035* | 1011      | 220              | 35                | 77            | 16          | 17                    | 2800                    |
| 40 Volt         |           |                  |                   |               |             |                       |                         |
| RHA0607270M040* | 0607      | 27               | 40                | 11            | 16          | 70                    | 1200                    |
| RHA0809560M040* | 0809      | 56               | 40                | 22            | 16          | 32                    | 1700                    |
| RHA1009101M040* | 1009      | 100              | 40                | 40            | 16          | 24                    | 2400                    |
| RHA1011121M040* | 1011      | 120              | 40                | 48            | 16          | 18                    | 2700                    |
| 50 Volt         |           |                  |                   |               |             |                       |                         |
| RHA0607150M050* | 0607      | 15               | 50                | 8             | 16          | 80                    | 1200                    |
| RHA0809330M050* | 0809      | 33               | 50                | 17            | 16          | 35                    | 1600                    |
| RHA1009560M050* | 1009      | 56               | 50                | 28            | 16          | 25                    | 2300                    |
| RHA1011820M050* | 1011      | 82               | 50                | 41            | 16          | 19                    | 2600                    |

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### RATINGS & PART NUMBER REFERENCE

| Part No.        | Case Size | Capacitance (μF) | Rated Voltage (V) | DCL Max. (μA) | DF Max. (%) | ESR Max. @100kHz (mΩ) | 100kHz RMS Current (mA) |
|-----------------|-----------|------------------|-------------------|---------------|-------------|-----------------------|-------------------------|
| <b>63 Volt</b>  |           |                  |                   |               |             |                       |                         |
| RHA0607100M063* | 0607      | 10               | 63                | 6             | 16          | 100                   | 1000                    |
| RHA0809220M063* | 0809      | 22               | 63                | 14            | 16          | 40                    | 1500                    |
| RHA0809330M063* | 0809      | 33               | 63                | 21            | 16          | 40                    | 1500                    |
| RHA1009330M063* | 1009      | 33               | 63                | 21            | 16          | 30                    | 2100                    |
| RHA1009470M063* | 1009      | 47               | 63                | 30            | 16          | 30                    | 2100                    |
| RHA1011560M063* | 1011      | 56               | 63                | 35            | 16          | 22                    | 2400                    |
| <b>80 Volt</b>  |           |                  |                   |               |             |                       |                         |
| RHA1009120M080* | 1009      | 12               | 80                | 10            | 16          | 70                    | 1600                    |
| RHA1009150M080* | 1009      | 15               | 80                | 12            | 16          | 70                    | 1600                    |
| RHA1011180M080* | 1011      | 18               | 80                | 14            | 16          | 50                    | 1800                    |
| <b>100 Volt</b> |           |                  |                   |               |             |                       |                         |
| RHA1009100M100* | 1009      | 10               | 100               | 10            | 16          | 80                    | 1400                    |
| RHA1009120M100* | 1009      | 12               | 100               | 12            | 16          | 80                    | 1400                    |
| RHA1011150M100* | 1011      | 15               | 100               | 15            | 16          | 60                    | 1600                    |
| <b>125 Volt</b> |           |                  |                   |               |             |                       |                         |
| RHA1009100M125* | 1009      | 10               | 125               | 13            | 16          | 90                    | 1200                    |

\* Used to denote packing type: "K" for Ammo Pack or "B" for Bulk.

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 2 minutes

### FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

| Capacitance Range | 100 ≤ F(Hz) <1K | 1K ≤ F(Hz) <10K | 10K ≤ F(Hz) <100K | 100K ≤ F |
|-------------------|-----------------|-----------------|-------------------|----------|
| 4.7 < C ≤ 33      | 0.05            | 0.32            | 0.67              | 1.00     |
| 33 < C            | 0.10            | 0.35            | 0.70              | 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.

### QUALIFICATION TABLE

| Test                     | RHA Series (Temperature Range -55°C to +105°C)                                                                                                                                                                          |                    |                                       |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------|
|                          | Condition                                                                                                                                                                                                               | Characteristics    |                                       |
| Endurance                | The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5000 to 10,000 hours at 105°C.<br>Φ6.3=5000hrs, D≥Φ8=10,000hrs.                         | Visual examination | no visible damage                     |
|                          |                                                                                                                                                                                                                         | ΔC/C               | ≤ ±30% of the initial limit           |
|                          |                                                                                                                                                                                                                         | DF:                | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | ESR:               | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | DCL:               | ≤ Initial specified limit             |
| Damp Heat (Steady State) | The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them to store at 60°C, 90 to 95% RH for 1000 hours, without DC applied                                        | Visual examination | no visible damage                     |
|                          |                                                                                                                                                                                                                         | ΔC/C               | ≤ ±30% of the initial limit           |
|                          |                                                                                                                                                                                                                         | DF:                | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | ESR:               | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | DCL:               | ≤ Initial specified limit             |
| Surge Voltage            | The capacitors shall be subjected to 1000 cycles each consisting of charge with the surge voltages specified at 15-35°C for 30 seconds through a protective resistor (R = 1 kΩ) and discharge for 5 minutes 30 seconds. | Visual examination | no visible damage                     |
|                          |                                                                                                                                                                                                                         | ΔC/C               | ≤ ±30% of the initial limit           |
|                          |                                                                                                                                                                                                                         | DF:                | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | ESR:               | ≤ 200% of the initial specified limit |
|                          |                                                                                                                                                                                                                         | DCL:               | ≤ Initial specified limit             |

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### STORAGE

1. It is recommended to keep capacitors between the ambient temperatures of 5°C to 35°C and a relative humidity of 75% or below.
2. 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.
- 3.

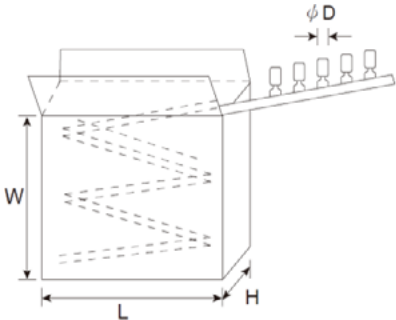
| Category         | Description    | Storage Life                                                              |
|------------------|----------------|---------------------------------------------------------------------------|
| Mid-High Voltage | 160V and above | 2yrs, after 1yr, needs to check characteristics, if NG, needs to do aging |
| Low Voltage      | 120V and below | 2yrs                                                                      |

Remark: Re-aging condition depends on its own spec.

### PACKAGE TAPE DIMENSIONS units (mm)

### AMMO PACKING

| Ammo Pack |     |     |     |            |             |             |
|-----------|-----|-----|-----|------------|-------------|-------------|
| Size Code | W±5 | L±5 | H±5 | Qty. (pcs) | G.W. kg/box | Box /Carton |
| 0607      | 235 | 327 | 54  | 1,500      | 1.12        | 10          |
| 0809      | 265 | 327 | 51  | 1,000      | 1.48        | 10          |
| 1009-1011 | 235 | 330 | 57  | 600        | 1.29        | 10          |

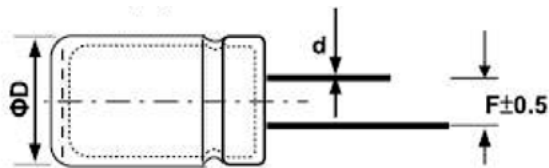


### BULK PACKING

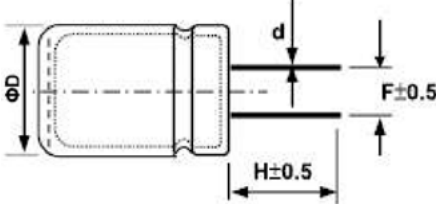
| Package Box |                |                |                    |                             |
|-------------|----------------|----------------|--------------------|-----------------------------|
| Size Code   | Bags Inner box | Layer Quantity | Quantity (pcs/bag) | Total quantity (pcs/carton) |
| 0607        | 9              | 2              | 1000               | 18,000                      |
| 0809        | 10             | 2              | 500                | 10,000                      |
| 1009-1011   | 11             | 2              | 200                | 4400                        |

### TERMINATION TYPE

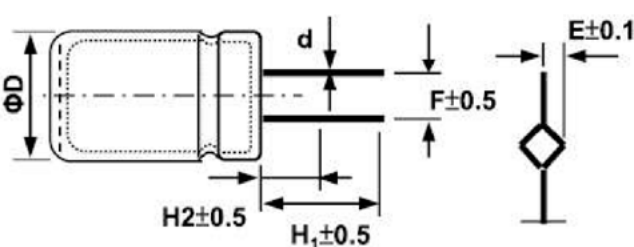
Letter “ ”: Empty = Standard Long lead.



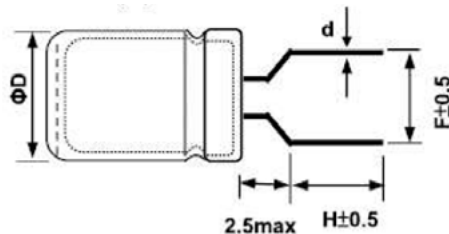
Letter “C”: Lead cut only.



Letter “D”: Lead cut and crimp.



Letter “F”: Lead cut and form.



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.

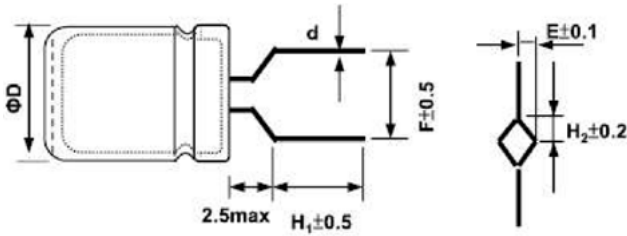
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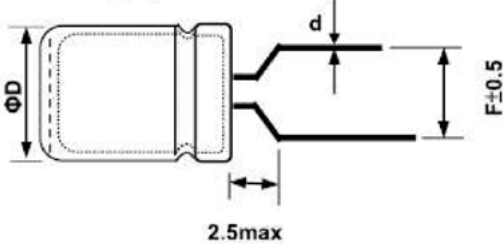


### TERMINATION TYPE

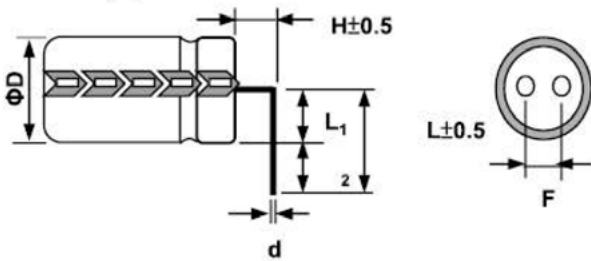
Letter "H": Lead cut, crimp, and form.



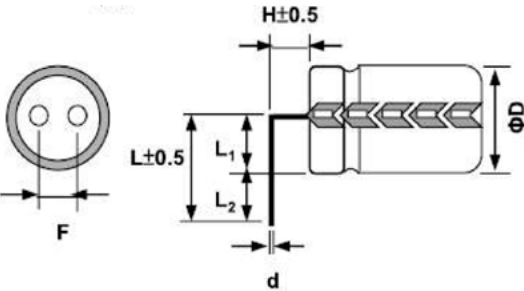
Letter "B": Forming only.



Letter "L": Lead cut and bend (Left).



Letter "Z": Lead cut and bend (Right).



| Letter | Termination Type           | Dø             | 4ø   | 5ø   | 6.3ø | 8ø   | 10ø  | 12.5ø | 13ø  | 14.5ø | 16ø  | 18ø  | 22ø   |
|--------|----------------------------|----------------|------|------|------|------|------|-------|------|-------|------|------|-------|
|        | Standard long lead         | F              | 1.50 | 2.00 | 2.50 | 3.50 | 5.00 | 5.00  | 5.00 | 7.50  | 7.50 | 7.50 | 10.00 |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 | 0.60 | 0.60  | 0.60 | 0.80  | 0.80 | 0.80 | 0.80  |
| C      | Lead cut only              | F              | 1.50 | 2.00 | 2.50 | 3.50 | 5.00 | 5.00  | 5.00 | 7.50  | 7.50 | 7.50 | 10.00 |
|        |                            | H              | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00  | 5.00 | 5.00  | 5.00 | 5.00 | 5.00  |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 | 0.60 | 0.60  | 0.60 | 0.80  | 0.80 | 0.80 | 0.80  |
| D      | Lead cut and crimp         | F              |      |      |      |      | 5.00 | 5.00  | 5.00 | 7.50  | 7.70 | 7.50 | 10.00 |
|        |                            | H <sub>1</sub> |      |      |      |      | 5.00 | 5.00  | 5.00 | 5.00  | 5.00 | 5.00 | 5.00  |
|        |                            | H <sub>2</sub> |      |      |      |      | 1.80 | 1.80  | 1.80 | 1.80  | 1.80 | 1.80 | 1.80  |
|        |                            | d              |      |      |      |      | 0.60 | 0.60  | 0.60 | 0.80  | 8.00 | 0.80 | 0.80  |
| F      | Lead cut and form          | F              | 5.00 | 5.00 | 5.00 | 5.00 |      |       |      |       |      |      |       |
|        |                            | H              | 4.00 | 5.00 | 5.00 | 5.00 |      |       |      |       |      |      |       |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 |      |       |      |       |      |      |       |
| H      | Lead, cut, crimp, and form | F              | 5.00 | 5.00 | 5.00 | 5.00 |      |       |      |       |      |      |       |
|        |                            | H <sub>1</sub> | 4.00 | 5.00 | 5.00 | 5.00 |      |       |      |       |      |      |       |
|        |                            | H <sub>2</sub> | 1.80 | 1.80 | 1.80 | 1.80 |      |       |      |       |      |      |       |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 |      |       |      |       |      |      |       |
| B      | Forming only               | F              | 5.00 | 5.00 | 5.00 | 5.00 |      |       |      |       |      |      |       |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 |      |       |      |       |      |      |       |
| L/Z    | Lead cut and bend          | F              | 1.50 | 2.00 | 2.50 | 3.50 | 5.00 | 5.00  | 5.00 | 7.50  | 7.50 | 7.50 | 10.00 |
|        |                            | H              | 2.00 | 2.00 | 2.00 | 2.50 | 2.50 | 2.50  | 2.50 | 2.50  | 2.50 | 2.50 | 2.50  |
|        |                            | L <sub>1</sub> | 2.20 | 2.70 | 3.40 | 4.50 | 5.30 | 6.60  | 6.80 | 7.70  | 8.40 | 9.40 | 11.40 |
|        |                            | L <sub>2</sub> | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50  | 3.50 | 3.50  | 3.50 | 3.50 | 3.50  |
|        |                            | d              | 0.45 | 0.50 | 0.50 | 0.50 | 0.60 | 0.60  | 0.60 | 0.80  | 0.80 | 0.80 | 0.80  |

\*All dimensions in mm.