

# DATA SHEET

## METAL FILM RESISTORS

High Power, Flameproof  
FMP Series

$\pm 1\%$ ,  $\pm 5\%$

1/2W to 3W

RoHS compliant & Halogen Free



**YAGEO**

Product specification – May 14, 2024 V.6





## APPLICATIONS

- All general purpose applications
- Power applications

## FEATURES

- Ultra miniature size
- Wide resistance range
- High power rating
- High stability
- PPAP ready (FMP-50)
- Flameproof coating equivalent to UL94V-0
- RoHS compliant & halogen-free

## ORDERING INFORMATION

Part number of the high power, flameproof metal film resistor are identified by the series, power rating, tolerance, packing, temperature coefficient, forming and resistance value.

## PART NUMBER

| <u>FMP</u><br>(1) | <u>200</u><br>(2) | <u>F</u><br>(3) | <u>I</u><br>(4) | <u>F</u><br>(5) | <u>52-</u><br>(6) | <u>100R</u><br>(7) |
|-------------------|-------------------|-----------------|-----------------|-----------------|-------------------|--------------------|
|-------------------|-------------------|-----------------|-----------------|-----------------|-------------------|--------------------|

### (1) SERIES

FMP Series

### (2) POWER RATING

-50 = 1/2W

100 = 1W

200 = 2W

3WS = 3W

300 = 3W

### (3) TOLERANCE

F =  $\pm 1\%$

J =  $\pm 5\%$

### (4) PACKAGING

R = Reel Pack

T = Box Pack

B = Bulk

### (5) TEMPERATURE COEFFICIENT OF RESISTANCE

E =  $\pm 50\text{ppm}/^\circ\text{C}$

F =  $\pm 100\text{ppm}/^\circ\text{C}$

- = Based on spec.

### (6) FORMING

26- = 26mm

52- = 52.4mm

73- = 73mm

52E = 52.4mm,  $\Phi d = 0.70 \pm 0.05\text{mm}$

52J = 52.4mm,  $\Phi d = 0.8 \pm 0.05\text{mm}$

52G = 52.4mm,  $\Phi d \geq 0.6\text{mm}$

M = M Type Forming

F = F Type Forming

FK = FK Type Forming

FFK = FFK Type Forming

FKK = FKK Type Forming

FT = FT Type Forming

MT = MTsert

PN = PANAsert

AV = AVIsert

Note: 26mm, 52.4mm and 73mm represent dimension A of the axial type, please refer to the category of AXIAL/REEL TAPE SPECIFICATION for the detail.

### (7) RESISTANCE VALUE

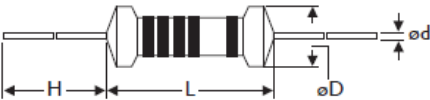
E24 & E96 Series

Example:

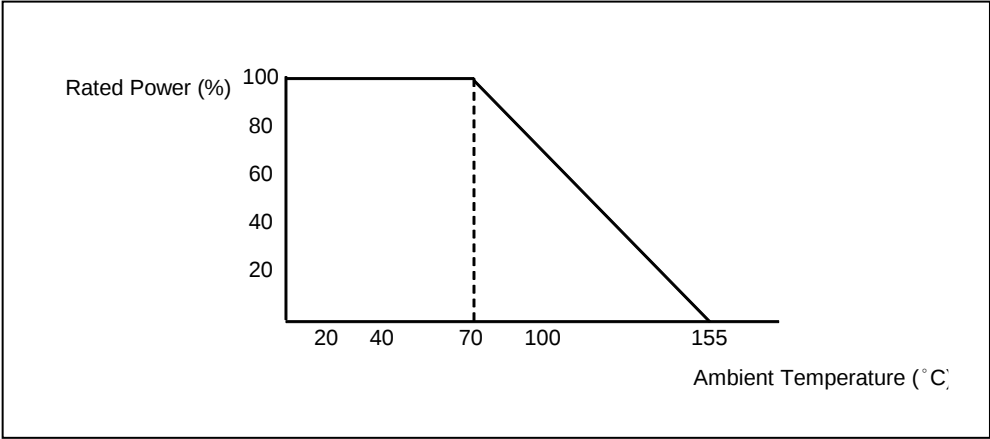
100R = 100 $\Omega$ , 10K = 10,000 $\Omega$ , 1M = 1,000,000 $\Omega$

DIMENSIONS

Unit: mm

|                                                                                   | Ultra Miniature | L          | ψD        | H        | ψd         |
|-----------------------------------------------------------------------------------|-----------------|------------|-----------|----------|------------|
|  | FMP-50          | 3.4 ± 0.3  | 1.9 ± 0.2 | 28 ± 2.0 | 0.45 ±0.05 |
|                                                                                   | FMP100          | 6.3 ± 0.5  | 2.4 ± 0.2 | 28 ± 2.0 | 0.55 ±0.05 |
|                                                                                   | FMP200          | 9.0 ± 0.5  | 3.9 ± 0.3 | 26 ± 2.0 | 0.55 ±0.05 |
|                                                                                   | FMP3WS          | 11.5 ± 1.0 | 4.5 ± 0.5 | 35 ± 2.0 | 0.8±0.05   |
|                                                                                   | FMP300          | 15.5± 1.0  | 5.0 ± 0.5 | 33 ± 2.0 | 0.8±0.05   |

DERATING CURVE



ELECTRICAL CHARACTERISTICS

| CHARACTERISTICS             | FMP-50                                                  | FMP100 | FMP200 | FMP3WS | FMP300 |
|-----------------------------|---------------------------------------------------------|--------|--------|--------|--------|
| Power Rating at 70 °C       | 1/2W                                                    | 1W     | 2W     | 3W     | 3W     |
| Maximum Working Voltage     | 200V                                                    | 350V   | 500V   | 500V   | 750V   |
| Maximum Overload Voltage    | 400V                                                    | 600V   | 700V   | 700V   | 1000V  |
| Voltage Proof on Insulation | 300V                                                    | 500V   | 500V   | 500V   | 500V   |
| Resistance Range            | 1Ω ~ 4M7Ω for E24 & E96 series value                    |        |        |        |        |
| Operating Temp. Range       | - 55°C to +155°C                                        |        |        |        |        |
| Temperature Coefficient     | ±100ppm/°C , ±50ppm/°C(FMP-50 & FMP100 types, R ≥ 10RΩ) |        |        |        |        |

Note: For resistance value out of above range is by request.

**TEST AND REQUIREMENTS**

| TEST                          | TEST METHOD      | PROCEDURE                                                                                | APPRAISE                                  |
|-------------------------------|------------------|------------------------------------------------------------------------------------------|-------------------------------------------|
| Short Time Overload           | IEC 60115-1 4.13 | 2.5 times RCWV for 5 sec.(Not more than maximum overload voltage)                        | $\pm 1.0 \% + 0.05\Omega$                 |
| Voltage Proof on Insulation   | IEC 60115-1 4.7  | In V-Block for 60 sec. test voltage as above table                                       | No Breakdown                              |
| Temperature Coefficient       | IEC 60115-1 4.8  | Between -55°C to +155°C                                                                  | By Type                                   |
| Insulation Resistance         | IEC 60115-1 4.6  | In V-Block for 60 sec.                                                                   | >1,000M $\Omega$                          |
| Solderability                 | IEC 60115-1 4.17 | 245 $\pm$ 5°C for 3 $\pm$ 0.5 Sec.                                                       | 95% Min. coverage                         |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5 $\pm$ 0.5 Min. with ultrasonic                                                 | No deterioration of coatings and markings |
| Robustness of Terminations    | IEC 60115-1 4.16 | Direct load for 10 Sec. in the direction of the terminal leads                           | $\geq 2.5\text{Kg}(24.5\text{N})$         |
| Periodic-pulse Overload       | IEC 60115-1 4.39 | 4 times RCWV(or Umax., whichever less) 10,000 cycles (1 Sec. on, 25 Sec.off)             | $\pm 1.0\%+0.05\Omega$                    |
| Damp Heat Steady State        | IEC 60115-1 4.24 | 40 $\pm$ 2°C,90-95% RH for 56 days, loaded with 0.1 times RCWV(or Umax., whichever less) | $\pm 2.0\%+0.05\Omega$                    |
| Endurance at 70°C             | IEC 60115-1 4.25 | 70 $\pm$ 2°C at RCWV(or Umax., whichever less) for 1,000 Hr.(1.5 Hr.on,0.5 Hr. off)      | $\pm 2.0\%+0.05\Omega$                    |
| Temperature Cycling           | IEC 60115-1 4.19 | -55°C → Room Temp. → +155°C → Room Temp.(5 cycles)                                       | $\pm 1.0\%+0.05\Omega$                    |
| Resistance to Soldering Heat  | IEC 60115-1 4.18 | 260 $\pm$ 3°C for 10 $\pm$ 1 Sec., immersed to a point 3 $\pm$ 0.5mm from the body       | $\pm 0.25\%+0.05\Omega$                   |
| Accidental Overload Test      | IEC 60115-1 4.26 | 4 times RCWV(or Umax., whichever less) for 1 Min.                                        | No evidence of flaming or arcing          |

Note:

**RCWV (Rated Continuous Working Voltage ):**

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V=\sqrt{(P \times R)}$$

or max. working voltage whichever is less

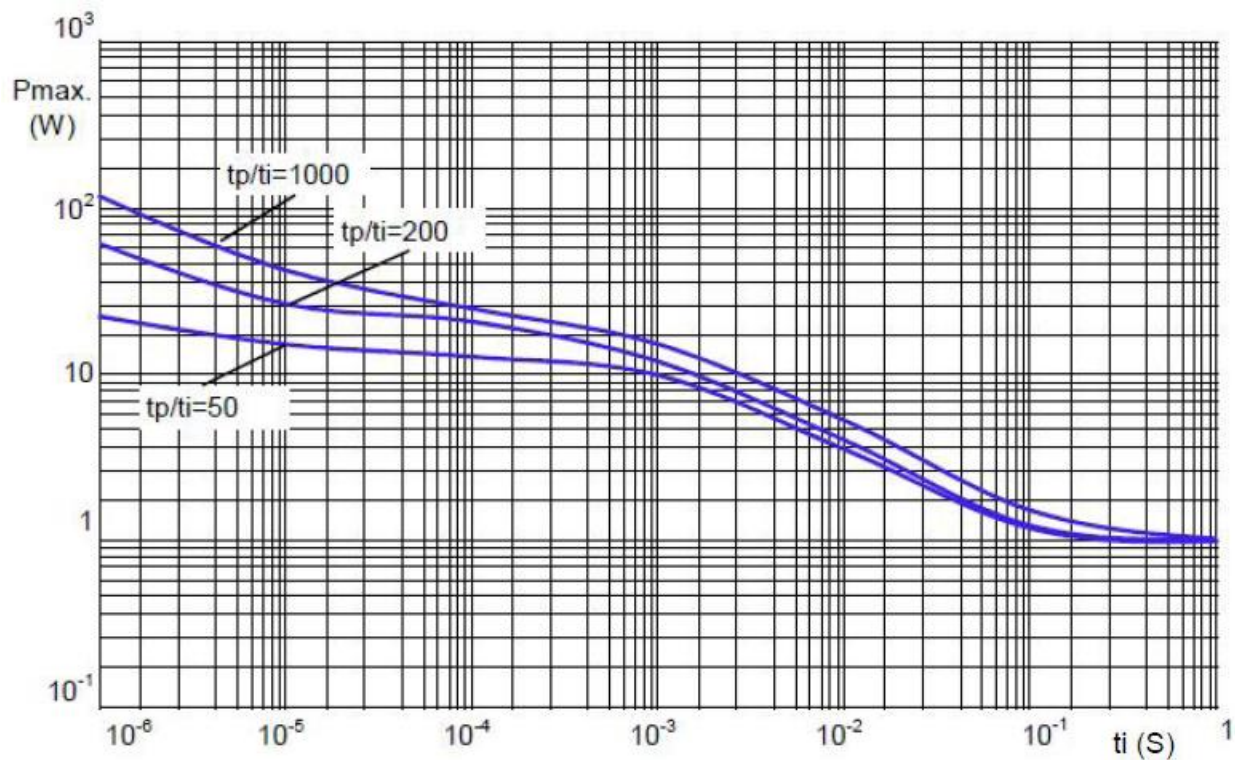
Where

V=Continuous rated DC or

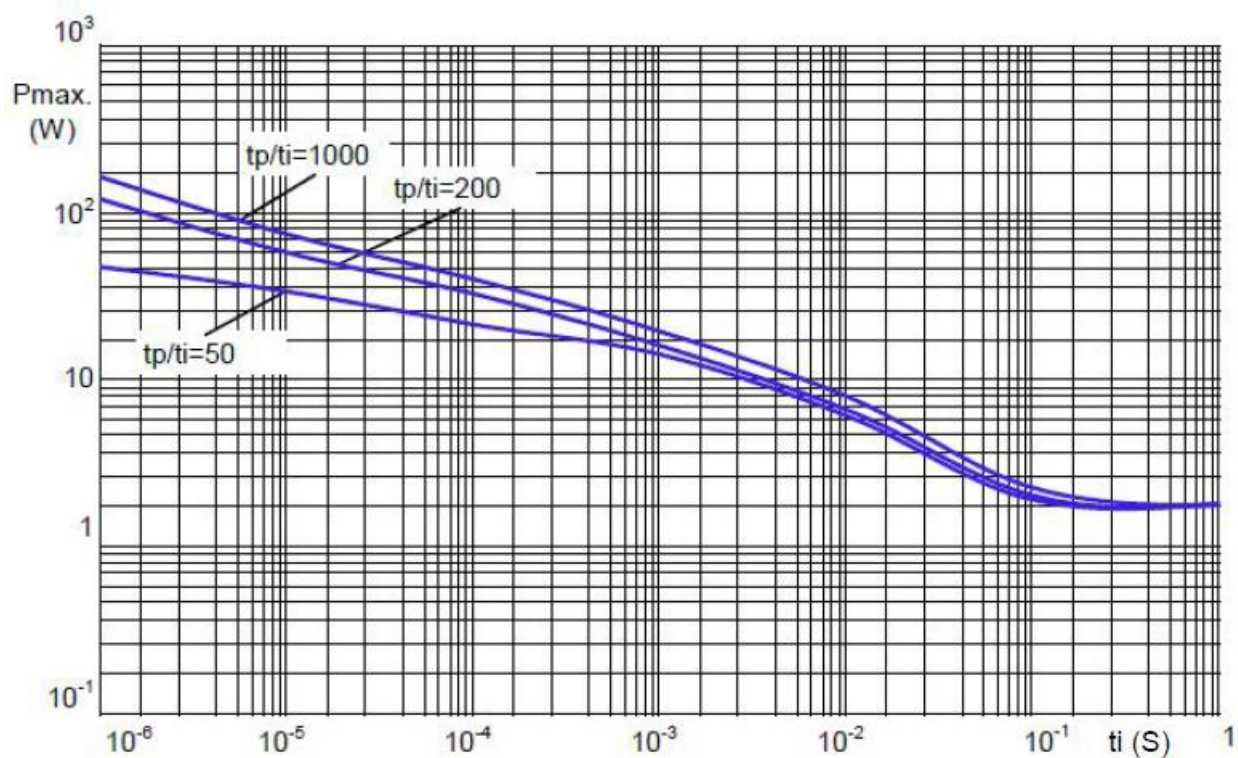
AC (rms) working voltage (V)

P=Rated power (W)

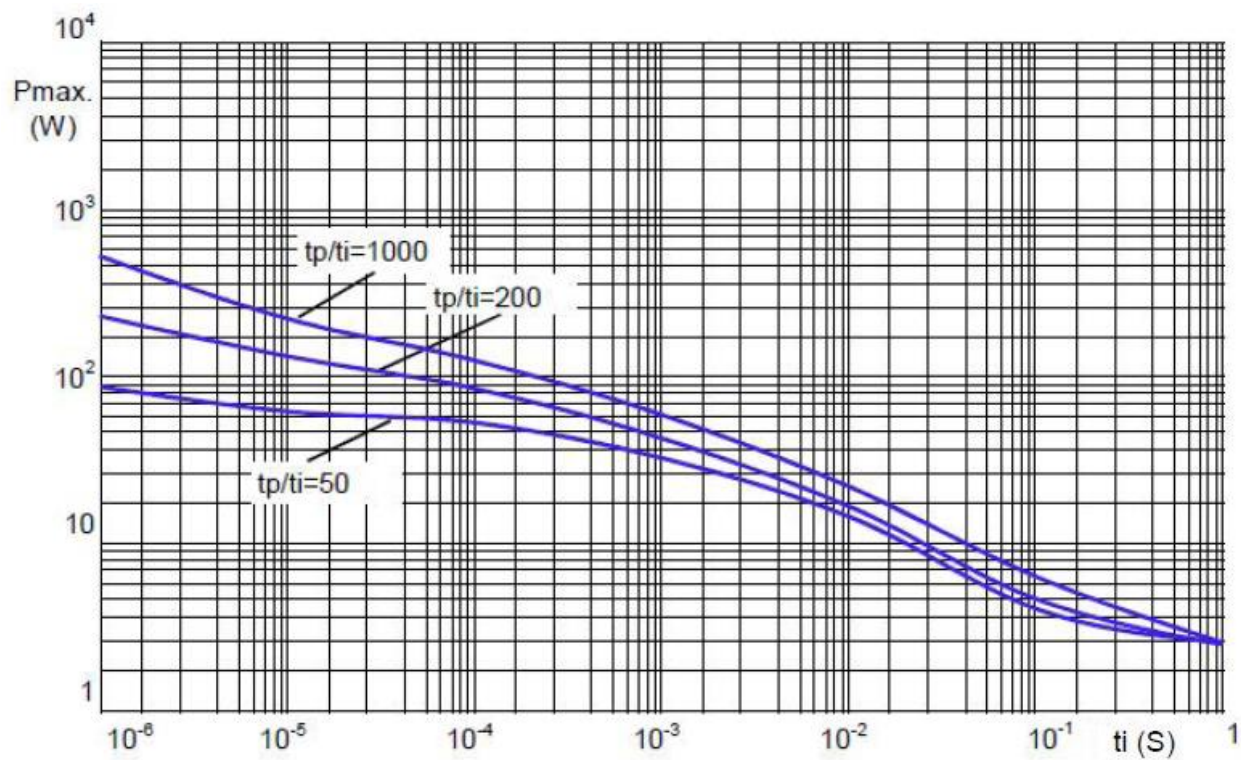
R=Resistance value ( $\Omega$ )

**PULSE DIAGRAMS**

FMP100 Series:  $P_{max}$ : Maximum permissible peak pulse power  
 $t_i$ : Pulse duration  
 $t_p$ : Pulse repetition time

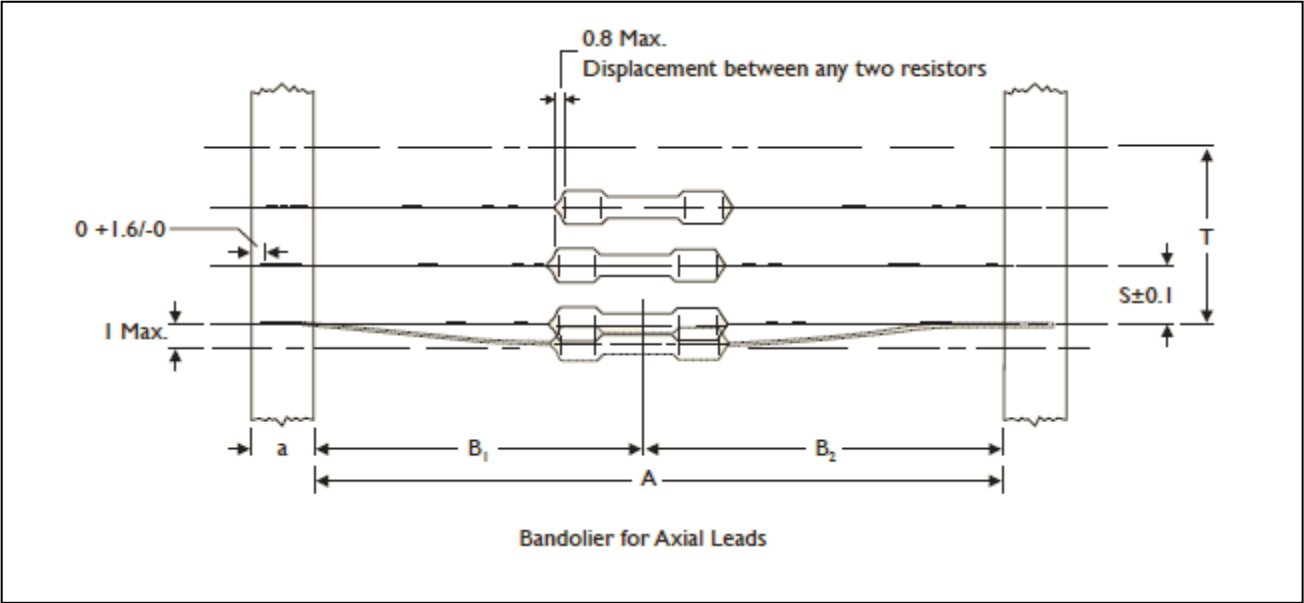


FMP200 Series:  $P_{max}$ : Maximum permissible peak pulse power  
 $t_i$ : Pulse duration  
 $t_p$ : Pulse repetition time



FMP300 Series:  $P_{max}$ : Maximum permissible peak pulse power  
 $t_i$ : Pulse duration  
 $t_p$ : Pulse repetition time

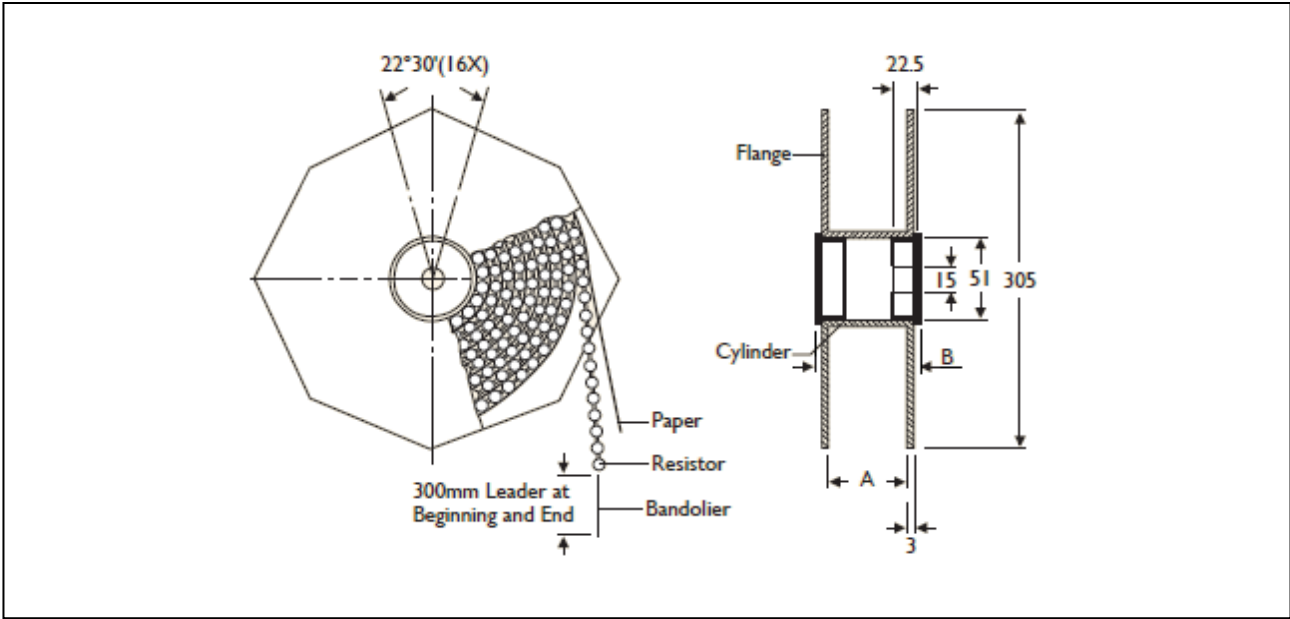
AXIAL / REEL TAPE SPECIFICATION



Unit: mm

| Ultra Miniature  | a       | A          | B1-B2 (Max.) | S (spacing) | T (max. deviation of spacing)               |
|------------------|---------|------------|--------------|-------------|---------------------------------------------|
| FMP-50           | 6 ± 0.5 | 52.4 ± 1.5 | 1.2          | 5           | 0.5 mm per 5 spacing<br>1 mm per 10 spacing |
|                  |         | 26.0 ± 1.5 | 1            |             |                                             |
| FMP100<br>FMP200 | 6 ± 0.5 | 52.4 ± 1.5 | 1.2          | 5           |                                             |
| FMP3WS           | 6 ± 0.5 | 73.0 ± 1.5 | 1.5          | 5           |                                             |
|                  |         | 52.4 ± 1.5 | 1.2          |             |                                             |
| FMP300           | 6 ± 0.5 | 73.0 ± 1.5 | 1.5          | 10          |                                             |

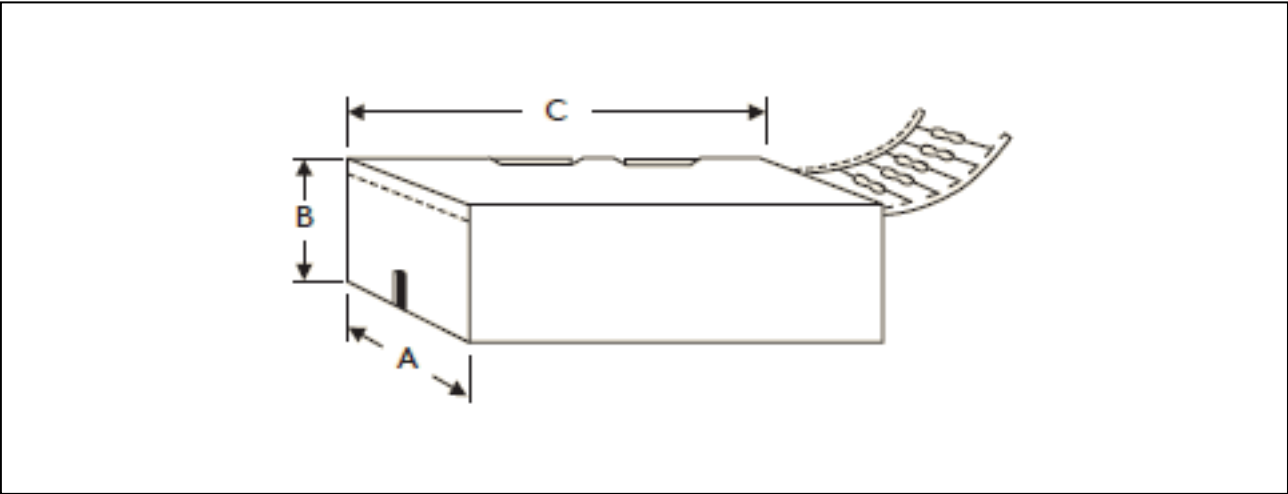
TAPE ON REEL PACKING



TYPE Unit: mm/piece

| Ultra Miniature | Across Flange(A) | B    | Quantity Per Reel |
|-----------------|------------------|------|-------------------|
| FMP-50          | 66.5             | 75.5 | 5,000             |
| FMP100          | 66.5             | 75.5 | 5,000             |
| FMP200          | 66.5             | 75.5 | 2,500             |
| FMP3WS          | 87               | 96   | 2,000             |
| FMP300          | 87               | 96   | 1,000             |

TAPE ON BOX PACKING



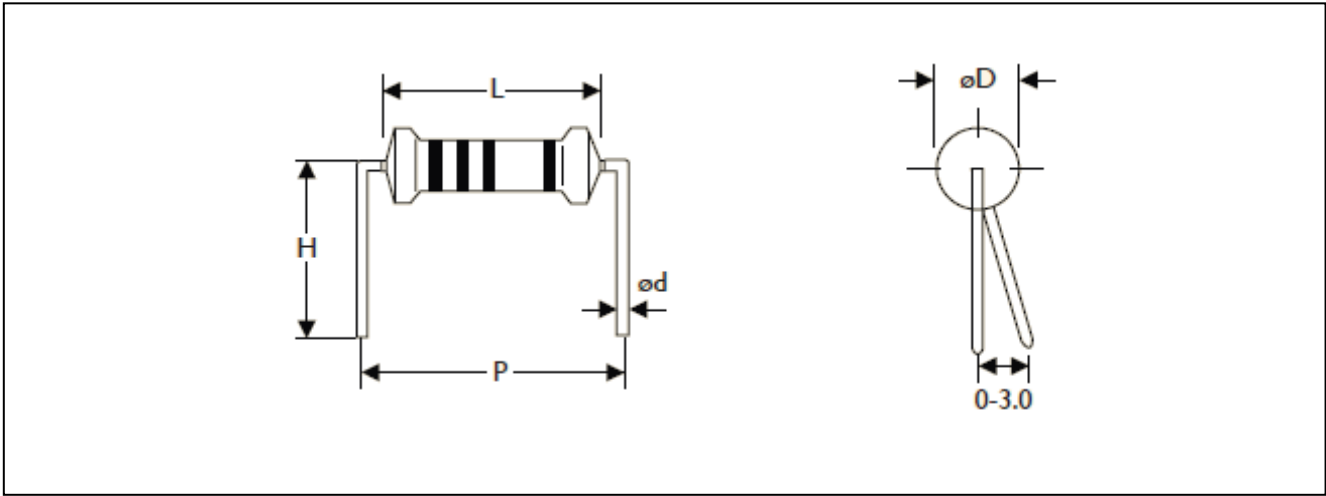
| TYPE            | DIMENSIONS |     |     | Unit: mm/piece   |
|-----------------|------------|-----|-----|------------------|
| Ultra Miniature | A          | B   | C   | Quantity Per Box |
| FMP-50          | 81         | 70  | 260 | 5,000            |
| FMP100          | 81         | 104 | 260 | 5,000            |
| FMP200          | 73         | 45  | 258 | 1,000            |
| FMP3WS          | 103        | 78  | 260 | 1,000            |
| FMP300          | 103        | 78  | 260 | 1,000            |

BULK PACKING

| Ultra Miniature | Piece/Per Inner Box | Bag/Per Inner Box | Piece Per Bag |
|-----------------|---------------------|-------------------|---------------|
| FMP-50          | 10,000              | 10                | 1,000         |
| FMP100          | 10,000              | 10                | 1,000         |
| FMP200          | 5,000               | 5                 | 1,000         |
| FMP3WS          | 2,000               | 4                 | 500           |
| FMP300          | 1,000               | 2                 | 500           |

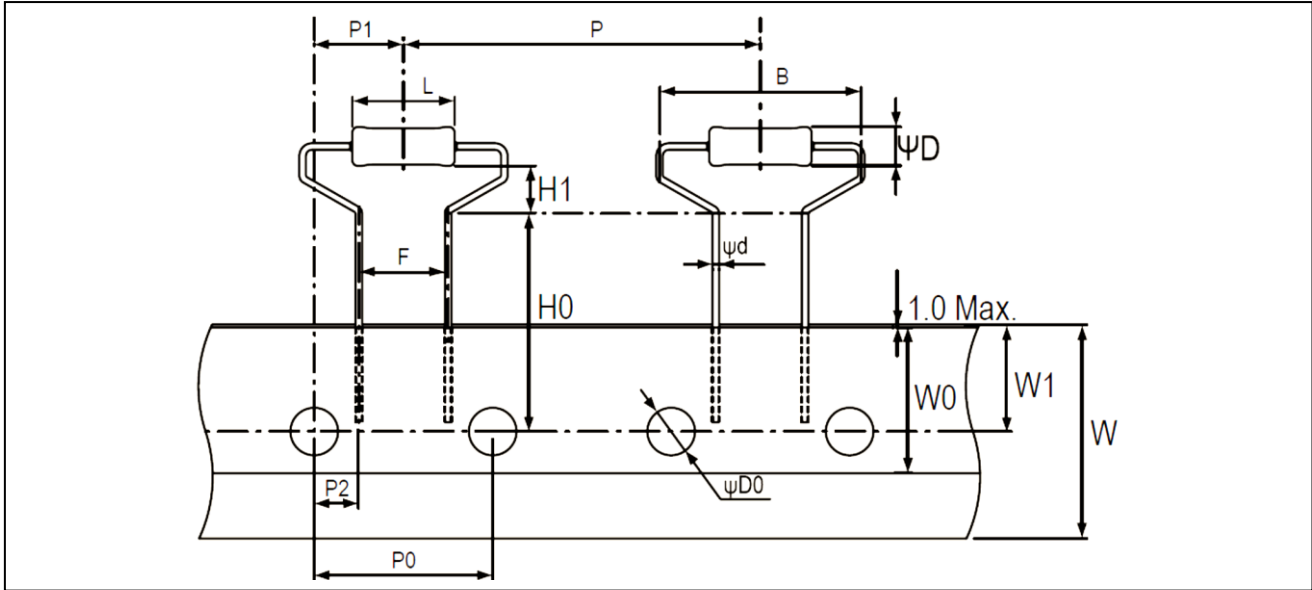
FORMING

M TYPE



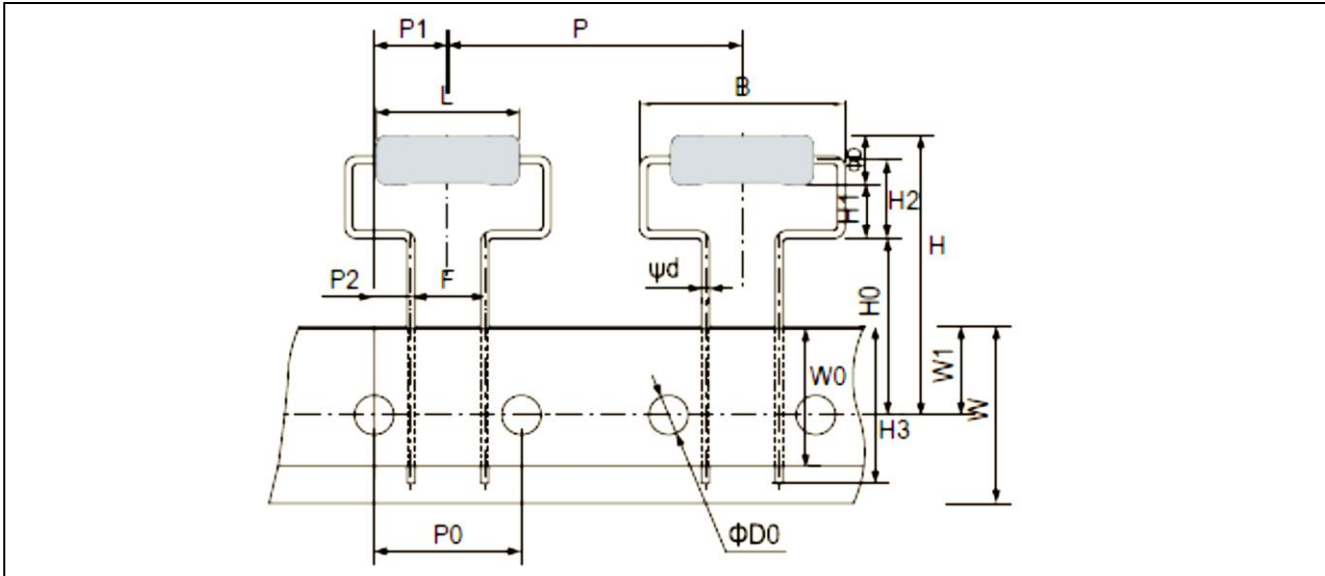
| TYPE            | DIMENSIONS |           |             |          |          | Unit: mm |
|-----------------|------------|-----------|-------------|----------|----------|----------|
| Ultra Miniature | L          | ψD        | ψd          | P        | H        |          |
| FMP-50          | 3.4± 0.3   | 1.9 ± 0.2 | 0.45 ± 0.05 | 6.0 ± 1  | 10.0 ±1  |          |
| FMP100          | 6.3 ± 0.5  | 2.4 ± 0.2 | 0.55 ± 0.05 | 10.0 ± 1 | 10.0 ± 1 |          |
| FMP300          | 15.5 ± 1.0 | 5.0± 0.5  | 0.8 ± 0.05  | 20.0 ± 1 | 15.0 ± 1 |          |

MHA TYPE



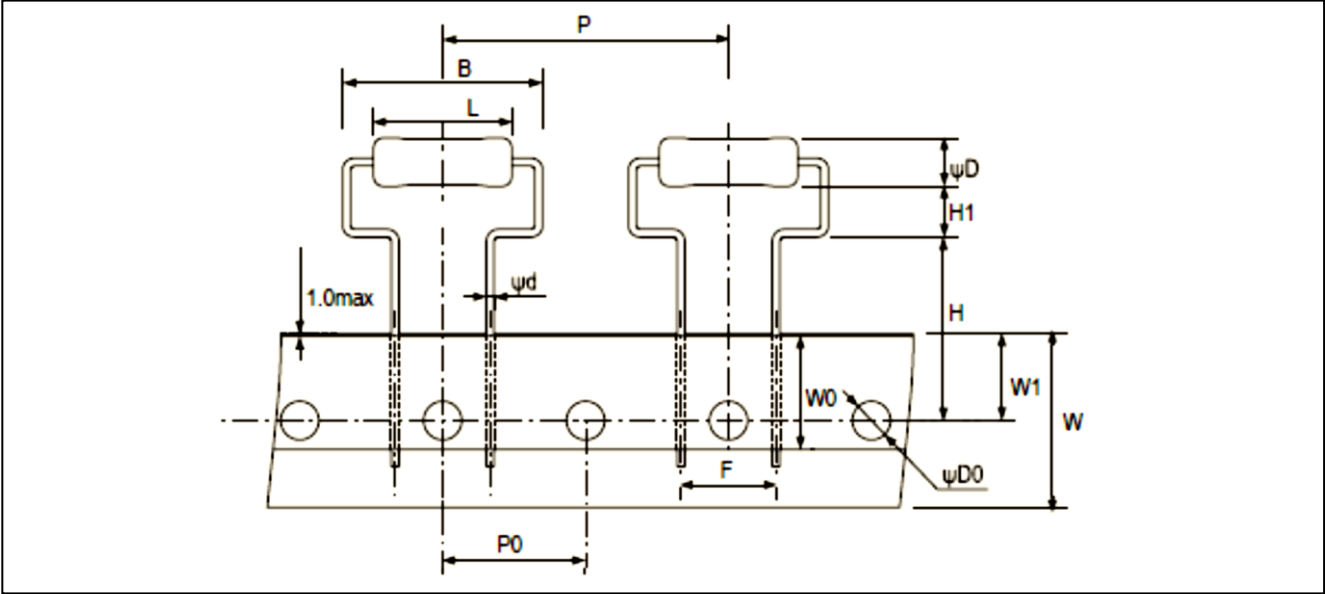
| TYPE      | DIMENSIONS |          |           |          |          |         |          |          | Unit: mm |
|-----------|------------|----------|-----------|----------|----------|---------|----------|----------|----------|
| Miniature | L          | ψD       | ψd        | B        | H0       | H1      | P        | P0       |          |
|           | 9.0±0.5    | 3.9±0.3  | 0.55±0.05 | 17.5Max  | 19.0±1.0 | 4.0±1.0 | 30.0±1.0 | 15.0±0.3 |          |
| FMP200    | P1         | P2       | F         | W        | W0       | W1      | ψD0      |          |          |
|           | 7.5±1.0    | 3.75±0.5 | 7.5±0.5   | 18.0±0.5 | 5.0Min   | 9.0±0.5 | 4.0±0.2  |          |          |

MHB TYPE



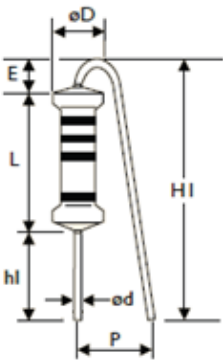
| TYPE      | DIMENSIONS |          |          |          |         |          |           |         |         | Unit: mm |
|-----------|------------|----------|----------|----------|---------|----------|-----------|---------|---------|----------|
| Miniature | L          | ψD       | ψd       | B        | H       | H0       | H1        | H2      | H3      |          |
|           | 15.5±1.0   | 5.0±0.5  | 0.8±0.05 | 21.0Max. | 30Max.  | 18.0±1.0 | 5.5(Ref.) | 8.0±1.5 | 16Max.  |          |
| FMP300    | P          | P0       | P1       | P2       | F       | W        | W0        | W1      | ψD0     |          |
|           | 30.0±1.0   | 15.0±0.3 | 7.5±1.0  | 3.75±0.8 | 7.5±0.5 | 18.0±0.5 | 5.0Min.   | 9.0±0.5 | 4.0±0.3 |          |

MHC TYPE

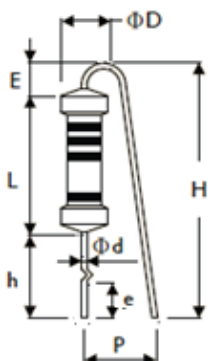


| TYPE      | DIMENSIONS |          |          |          |          |          |          |          | Unit: mm |
|-----------|------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Miniature | L          | ψD       | ψd       | B        | H        | H1       | P        | P0       |          |
|           | 15.5±1.0   | 5.0±0.5  | 0.8±0.05 | 21.0Max. | 19.0±1.0 | 5.25±1.0 | 30.0±1.0 | 15.0±0.3 |          |
| FMP300    | F          | W        | W0       | W1       | ψD0      |          |          |          |          |
|           | 10.0±0.5   | 18.0±0.5 | 5.0Min.  | 9.0±0.5  | 4.0±0.2  |          |          |          |          |

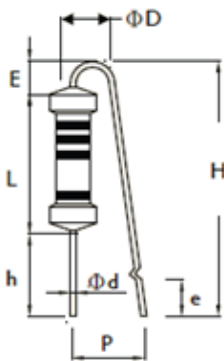
F TYPE



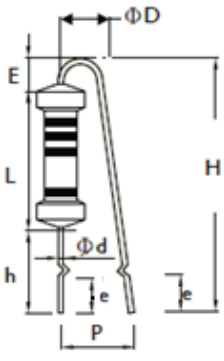
FK TYPE



FFK TYPE

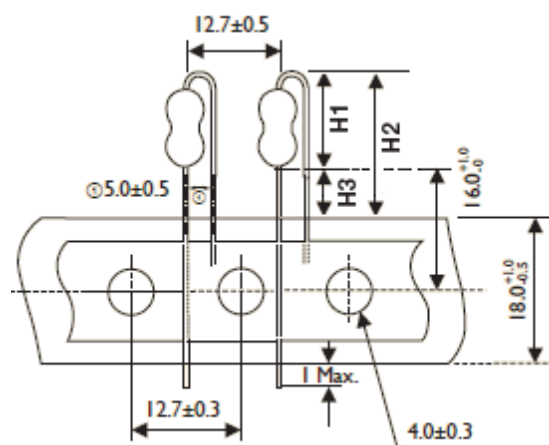


FKK TYPE



| TYPE            | DIMENSIONS |         |           |     |     |        |      |         |        |       | Unit: mm |
|-----------------|------------|---------|-----------|-----|-----|--------|------|---------|--------|-------|----------|
| Ultra Miniature | L          | ψD      | ψd        | P   | h   | H Max. | h1   | H1 Max. | E Max. | e     |          |
| FMP200          | 9.0±0.5    | 3.9±0.3 | 0.55±0.05 | 6±1 | -   | -      | 5± 1 | 18.5    | 3.5    | -     |          |
| FMP300          | 15.5±1     | 5.0±0.5 | 0.8±0.05  | 8±1 | 8±1 | 28     | 5± 1 | 25      | 3.5    | 3.5±1 |          |

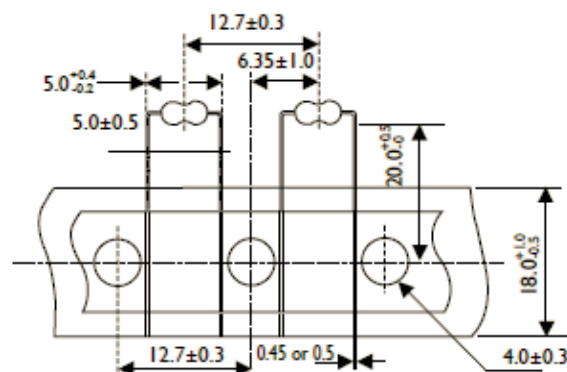
## FT TYPE (Taping Pack)



| TYPE            | DIMENSIONS |         |         | Unit: mm |
|-----------------|------------|---------|---------|----------|
| Ultra Miniature | H1 Max.    | H2 Max. | H3 Max. |          |
| FMP100          | 10         | 18.5    | 8.5     |          |
| FMP200          | 13         | 21.5    | 8.5     |          |
| FMP3WS          | 16         | 24.5    | 8.5     |          |

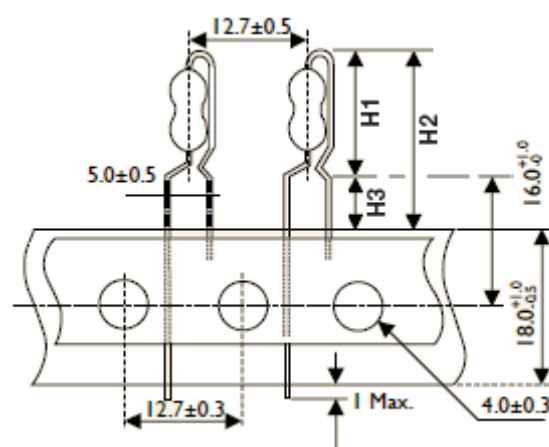
## MT TYPE (Taping Pack)

Rated Watts : 0.5W

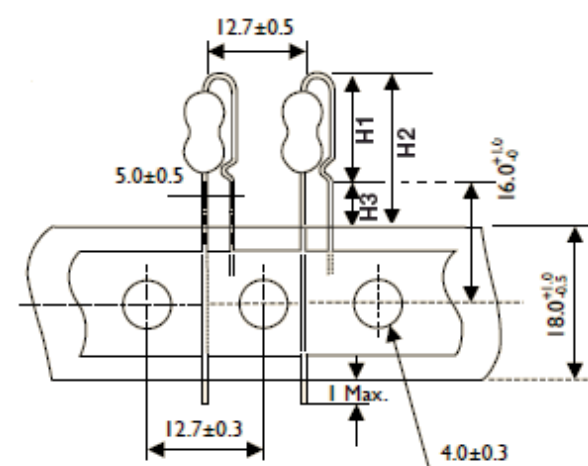


## AV TYPE (Taping Pack)

## PN TYPE (Taping Pack)



| TYPE            | DIMENSIONS |         |         | Unit: mm |
|-----------------|------------|---------|---------|----------|
| Ultra Miniature | H1 Max.    | H2 Max. | H3 Max. |          |
| FMP100          | 13         | 21.5    | 8.5     |          |
| FMP200          | 17         | 25.5    | 8.5     |          |
| FMP3WS          | 19         | 27.5    | 8.5     |          |



| TYPE            | DIMENSIONS |         |         | Unit: mm |
|-----------------|------------|---------|---------|----------|
| Ultra Miniature | H1 Max.    | H2 Max. | H3 Max. |          |
| FMP100          | 11.5       | 20      | 8.5     |          |
| FMP200          | 14.5       | 23      | 8.5     |          |
| FMP3WS          | 17.5       | 26      | 8.5     |          |

MARKING

4-BAND-CODE

±5%

| COLOR  | 1st BAND | 2nd BAND | 3rd BAND | MULTIPLIER | TOLERANCE   |
|--------|----------|----------|----------|------------|-------------|
| BLACK  | 0        | 0        | 0        | 1Ω         |             |
| BROWN  | 1        | 1        | 1        | 10Ω        | ± 1% ( F )  |
| RED    | 2        | 2        | 2        | 100Ω       |             |
| ORANGE | 3        | 3        | 3        | 1KΩ        |             |
| YELLOW | 4        | 4        | 4        | 10KΩ       |             |
| GREEN  | 5        | 5        | 5        | 100K       |             |
| BLUE   | 6        | 6        | 6        | 1MΩ        |             |
| VIOLET | 7        | 7        | 7        | 10MΩ       |             |
| GREY   | 8        | 8        | 8        | 0.001Ω     |             |
| WHITE  | 9        | 9        | 9        | 0.0001Ω    |             |
| GOLD   |          |          |          | 0.1Ω       | ± 5 % ( J ) |
| SILVER |          |          |          | 0.01Ω      |             |

±1%

5-BAND-CODE

**REVISION HISTORY**

| REVISION  | DATE         | CHANGE NOTIFICATION | DESCRIPTION                                          |
|-----------|--------------|---------------------|------------------------------------------------------|
| Version 6 | May.14, 2024 |                     | - Added 52G type                                     |
| Version 5 | Apr.2, 2024  |                     | - Added forming code description for part number     |
| Version 4 | Aug.31, 2023 |                     | - Update legal disclaimer and footer version numbers |
| Version 3 | May.25, 2023 |                     | - Updated the tape specification of FMP300           |
| Version 2 | Oct.25, 2021 |                     | - Add F type for FMP200 series                       |
| Version 1 | Oct.12, 2021 | -                   | - Updated the tape specification of FMP200           |
| Version 0 | Aug.2, 2021  | -                   | - First issue of this specification                  |

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