

# DATA SHEET

## CARBON FILM RESISTORS

General Purpose

CFR Series

$\pm 2\%$ ,  $\pm 5\%$

1/6W to 3W

RoHS compliant & Halogen Free



**YAGEO**

Product specification – September 2, 2022 V.1





## APPLICATIONS

- All general purpose applications
- Power applications

## FEATURES

- AEC-Q200 qualified
- Wide resistance range
- High stability
- PPAP ready  
(CFR-25/CFR50S)
- RoHS compliant &  
halogen-free

## ORDERING INFORMATION

Part number of the general purpose carbon film resistor are identified by the series, power rating, tolerance, packing, temperature coefficient, forming and resistance value.

## PART NUMBER

|            |            |          |          |          |            |             |
|------------|------------|----------|----------|----------|------------|-------------|
| <u>CFR</u> | <u>200</u> | <u>J</u> | <u>T</u> | <u>-</u> | <u>73-</u> | <u>100R</u> |
| (1)        | (2)        | (3)      | (4)      | (5)      | (6)        | (7)         |

**(1) SERIES NAME**

CFR Series

## (2) POWER RATING

|            |            |          |
|------------|------------|----------|
| -12 = 1/6W | -50 = 1/2W | 200 = 2W |
| 25S = 1/4W | 100 = 1W   | 3WS = 3W |
| -25 = 1/4W | 2WS = 2W   | 1WS = 1W |
| 50S = 1/2W |            |          |

### (3) TOLERANCE

$G = \pm 2\%$   $J = \pm 5\%$

#### (4) PACKAGING

R = Reel Pack                      B = Bulk  
T = Box Pack

### (5) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec , please refer to page 4 Table 2 .

## (6) FORMING

|                                                 |                            |
|-------------------------------------------------|----------------------------|
| 26- = 26mm                                      | M = M-Type Forming         |
| 52- = 52.4mm                                    | MT = MT Type Forming       |
| 73- = 73mm                                      | MB = M-form W/flat         |
| 73G = 73mm, $\Phi d \geq 0.6\text{mm}$          | FT = FT Type Forming       |
| 26A = 26mm, $\Phi d = 0.4 \pm 0.02\text{mm}$    | F = F Type                 |
| 26C = 26mm, $\Phi d = 0.5 \pm 0.02\text{mm}$    | FK = FK Type               |
| 26G = 26mm, $\Phi d \geq 0.6\text{mm}$          | FFK = F-form Kink          |
| 52A = 52.4mm, $\Phi d = 0.4 \pm 0.02\text{mm}$  | FKK = FKK Type             |
| 52B = 52.4mm, $\Phi d = 0.45 \pm 0.02\text{mm}$ | PN = PANAsert              |
| 52C = 52.4mm, $\Phi d = 0.5 \pm 0.02\text{mm}$  | AV = AVIsert               |
| 52G = 52.4mm, $\Phi d \geq 0.6\text{mm}$        | FB= FB- Type (for -25&50S) |
| 52H = 52.4mm, non-painting on welding spot      |                            |

**(7) RESISTANCE VALUE**

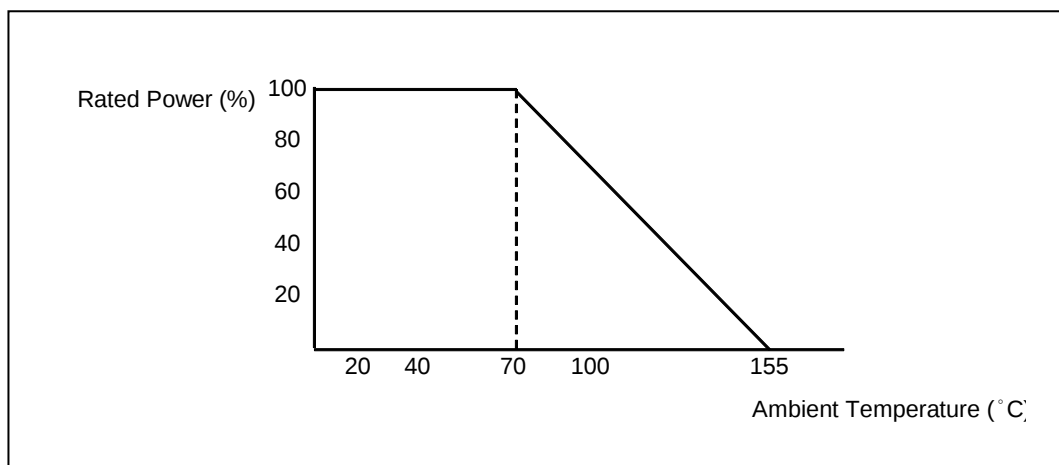
## E24 Series

Example:

100R = 100Ω, 10K = 10,000Ω, 1M = 1,000,000Ω

**DIMENSIONS**

| Unit: mm                                                                          |         |           |                |               |              |                 |
|-----------------------------------------------------------------------------------|---------|-----------|----------------|---------------|--------------|-----------------|
|                                                                                   | Normal  | Miniature | L              | $\psi D$      | H            | $\psi d$        |
|  | CFR-12  | CFR 25S   | $3.4 \pm 0.3$  | $1.9 \pm 0.2$ | $28 \pm 2.0$ | $0.45 \pm 0.05$ |
|                                                                                   | CFR -25 | CFR 50S   | $6.3 \pm 0.5$  | $2.4 \pm 0.2$ | $28 \pm 2.0$ | $0.55 \pm 0.05$ |
|                                                                                   | CFR -50 | CFR 1WS   | $9.0 \pm 0.5$  | $3.3 \pm 0.3$ | $26 \pm 2.0$ | $0.55 \pm 0.05$ |
|                                                                                   | CFR 100 | CFR 2WS   | $11.5 \pm 1.0$ | $4.5 \pm 0.5$ | $35 \pm 2.0$ | $0.8 \pm 0.05$  |
|                                                                                   | CFR 200 | CFR 3WS   | $15.5 \pm 1.0$ | $5.0 \pm 0.5$ | $33 \pm 2.0$ | $0.8 \pm 0.05$  |

**DERATING CURVE****ELECTRICAL CHARACTERISTICS****TABLE 1**

| CHARACTERISTICS             | CFR -12                        | CFR 25S | CFR -25 | CFR 50S | CFR -50 | CFR 1WS | CFR 100 | CFR 2WS | CFR 200 | CFR 3WS |
|-----------------------------|--------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Power Rating at 70 °C       | 1/6W                           | 1/4W    | 1/4W    | 1/2W    | 1/2W    | 1W      | 1W      | 2W      | 2W      | 3W      |
| Maximum Working Voltage     | 150V                           | 200V    | 250V    | 300V    | 350V    | 400V    | 500V    | 500V    | 500V    | 500V    |
| Maximum Overload Voltage    | 300V                           | 400V    | 500V    | 600V    | 700V    | 800V    | 1000V   | 1000V   | 1000V   | 1000V   |
| Voltage Proof on Insulation | 300V                           | 400V    | 500V    | 500V    | 500V    | 700V    | 1000V   | 1000V   | 1000V   | 1000V   |
| Resistance Range            | 1Ω ~ 10MΩ for E24 series value |         |         |         |         |         |         |         |         |         |
| Operating Temp. Range       | - 55°C to +155°C               |         |         |         |         |         |         |         |         |         |
| Temperature Coefficient     | see Table 2                    |         |         |         |         |         |         |         |         |         |

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

**TABLE 2 TEMPERATURE COEFFICIENT**

| TYPE                                                 | Temp. Coefficient ppm/°C |            |           |
|------------------------------------------------------|--------------------------|------------|-----------|
|                                                      | Under 100KΩ              | 100K ~ 1MΩ | 1M ~ 10MΩ |
| CFR100, CFR200, CFR2WS CFR3WS                        | ± 350                    | -500~0     | -1500~0   |
| CFR-12 , CFR-25 , CFR-50<br>CFR25S , CFR50S , CFR1WS | - 500 ~ +350             | -700~0     | -1500~0   |

**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)                   | ±0.75%+0.05Ω                              |
| 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.                                                              | >1,000MΩ                                  |
| Solderability                 | IEC 60115-1 4.17 | 245±5°C for 3±0.5 Sec.                                                              | 95% Min. coverage                         |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5±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                      | ≥2.5Kg(24.5N)                             |
| Periodic-pulse Overload       | IEC 60115-1 4.39 | 4 times RCWV(or Umax., whichever less) 10,000 cycles (1 Sec. on, 25 Sec.off)        | ±1.0%+0.05Ω                               |
| Damp Heat Steady State        | IEC 60115-1 4.24 | 40±2°C,90-95% RH for 56 days, loaded with 0.1 times RCWV (or Umax., whichever less) | ±3.0%+0.05Ω                               |
| Endurance at 70°C             | IEC 60115-1 4.25 | 70±2°C at RCWV(or Umax., whichever less) for 1,000 Hr.(1.5 Hr.on,0.5 Hr. off)       | ±3.0%+0.05Ω                               |
| Temperature Cycling           | IEC 60115-1 4.19 | -55°C → Room Temp. → +155°C → Room Temp.(5 cycles)                                  | ±1.0%+0.05Ω                               |
| Resistance to Soldering Heat  | IEC 60115-1 4.18 | 260±3°C for 10±1 Sec., immersed to a point 3±0.5mm from the body                    | ±1.0%+0.05Ω                               |

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

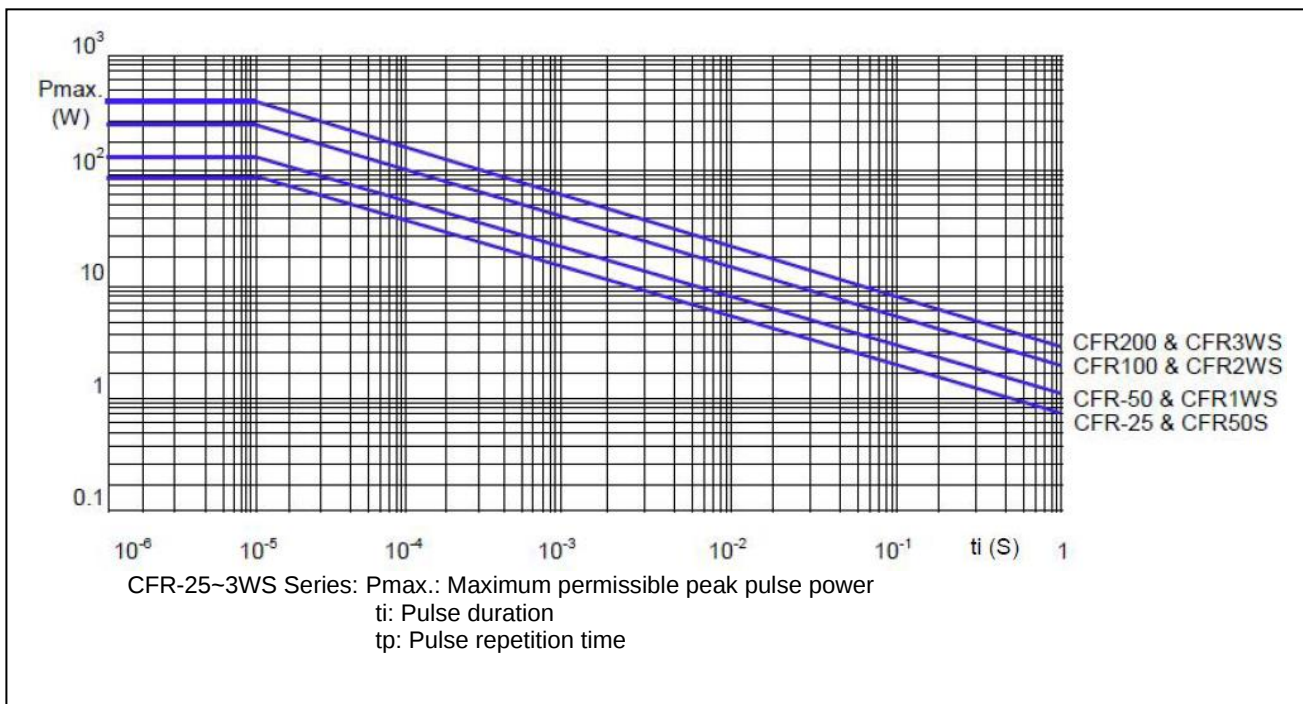
V=Continuous rated DC or

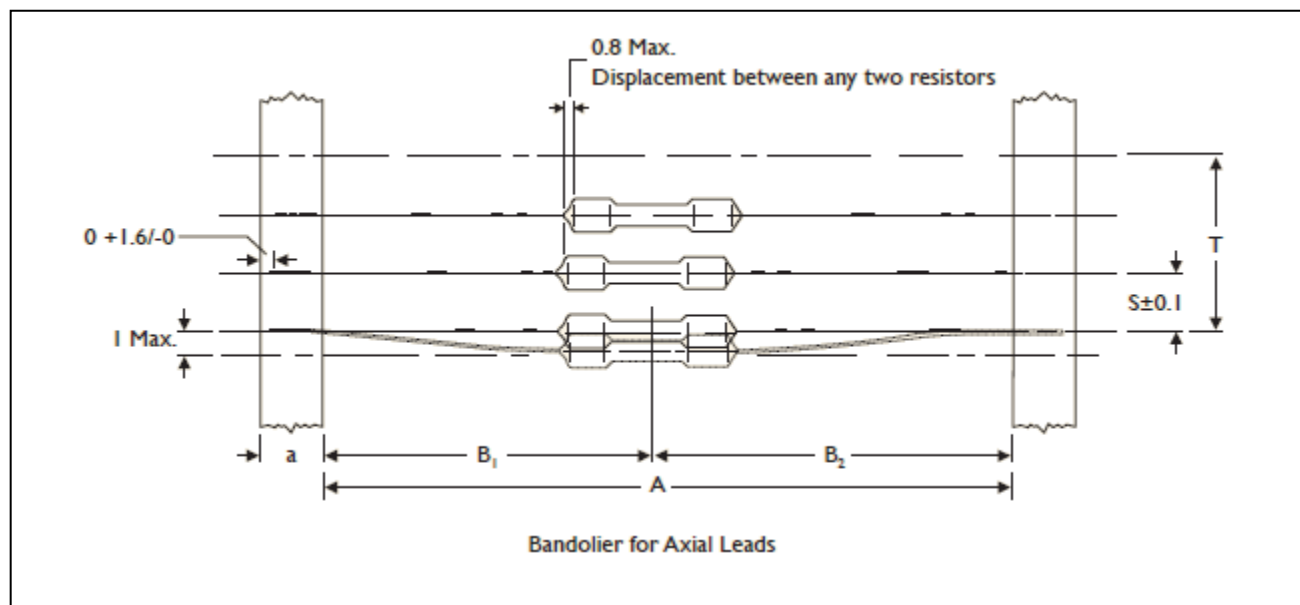
AC (rms) working voltage (V)

P=Rated power (W)

R=Resistance value ( $\Omega$ )

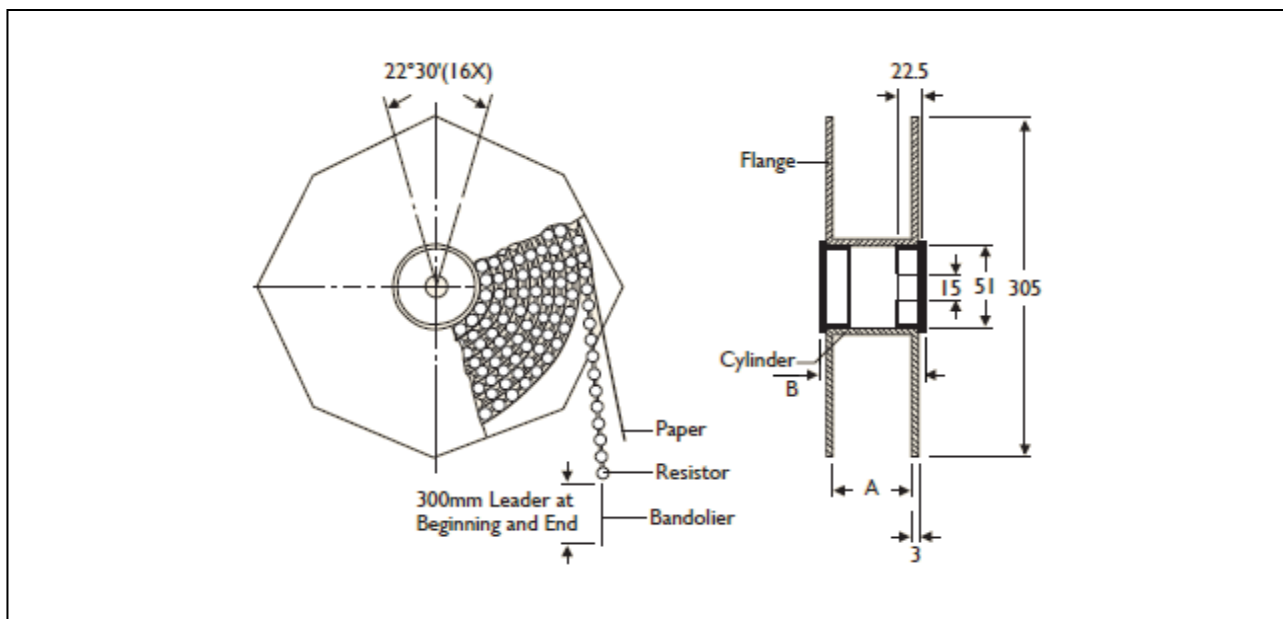
### PULSE DIAGRAMS



**AXIAL / REEL TAPE SPECIFICATION**

Unit: mm

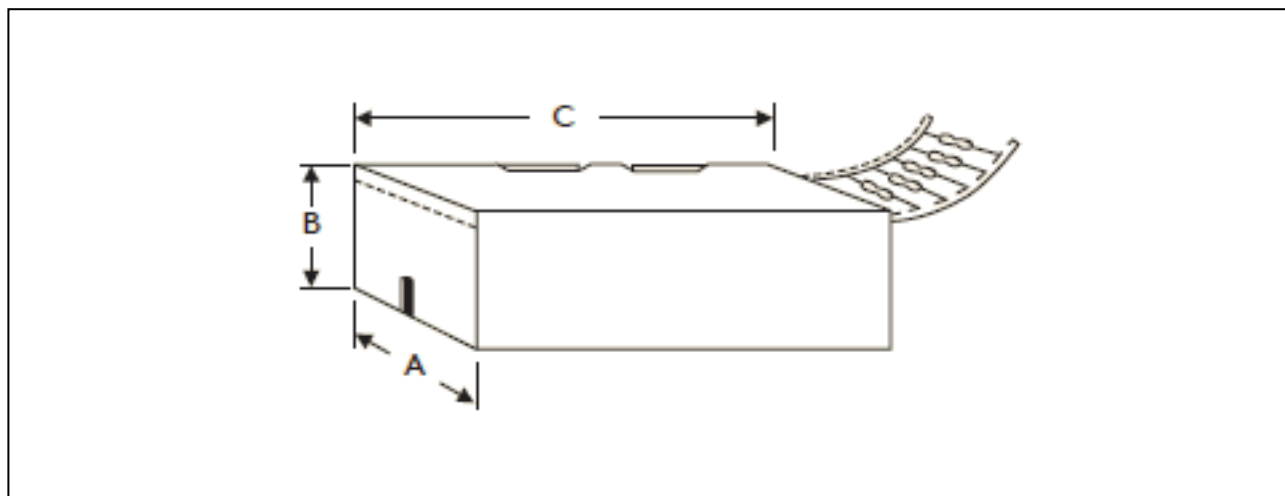
| Normal | Miniature | a       | A          | B1-B2 (Max.) | S (spacing) | T (max. deviation of spacing)                |
|--------|-----------|---------|------------|--------------|-------------|----------------------------------------------|
| CFR-12 | CFR25S    | 6 ± 0.5 | 52.4 ± 1.5 | 1.2          | 5           | 1 mm per 10 spacing,<br>0.5 mm per 5 spacing |
|        |           |         | 26.0 ± 1.5 | 1.0          |             |                                              |
| CFR-25 | CFR50S    | 6 ± 0.5 | 52.4 ± 1.5 | 1.2          | 5           |                                              |
|        |           |         | 26.0 ± 1.5 | 1.0          |             |                                              |
| CFR-50 | CFR1WS    | 6 ± 0.5 | 52.4 ± 1.5 | 1.2          | 5           |                                              |
| CFR100 | CFR2WS    | 6 ± 0.5 | 73.0 ± 1.5 | 1.5          | 5           |                                              |
|        |           |         | 52.4 ± 1.5 | 1.2          |             |                                              |
| CFR200 | CFR3WS    | 6 ± 0.5 | 73.0 ± 1.5 | 1.5          | 10          |                                              |
|        |           |         | 52.4 ± 1.5 | 1.2          |             |                                              |

**TAPE ON REEL PACKING**

TYPE

Unit: mm/piece

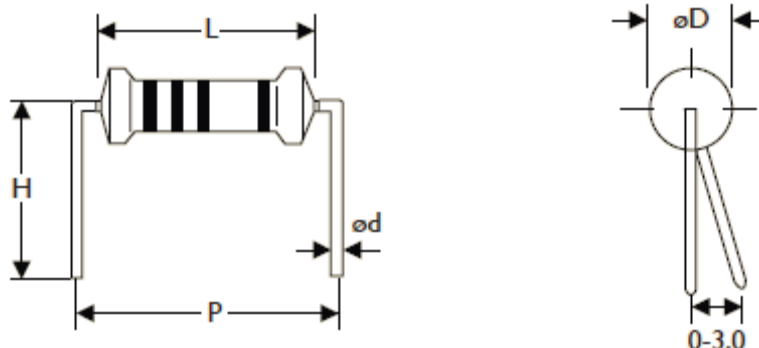
| Normal | Miniature | Across Flange(A) | B    | Quantity Per Reel |
|--------|-----------|------------------|------|-------------------|
| CFR-12 | CFR25S    | 66.5             | 75.5 | 5,000             |
| CFR-25 | CFR50S    | 66.5             | 75.5 | 5,000             |
| CFR-50 | CFR1WS    | 66.5             | 75.5 | 2,500             |
| CFR100 | CFR2WS    | 87               | 96   | 2,000             |
| CFR200 | CFR3WS    | 87               | 96   | 1,000             |

**TAPE ON BOX PACKING**

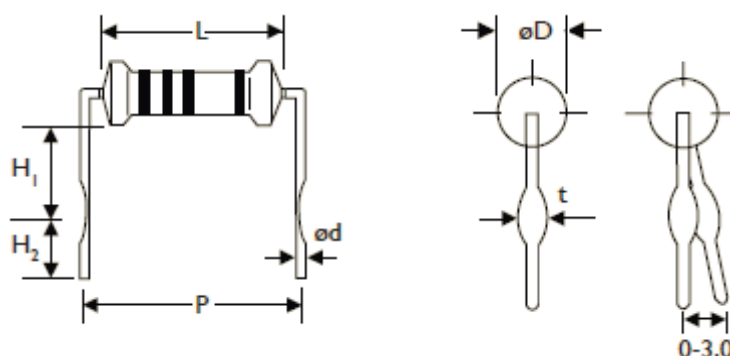
| TYPE   |           | DIMENSIONS |     |     | Unit: mm/piece   |
|--------|-----------|------------|-----|-----|------------------|
| Normal | Miniature | A          | B   | C   | Quantity Per Box |
| CFR-12 | CFR25S    | 48         | 102 | 255 | 5,000            |
| CFR-12 | CFR25S    | 81         | 70  | 260 | 5,000            |
| CFR-25 | CFR50S    | 48         | 102 | 255 | 5,000            |
| CFR-25 | CFR50S    | 81         | 104 | 260 | 5,000            |
| CFR-50 | CFR1WS    | 73         | 45  | 258 | 1,000            |
| CFR100 | CFR2WS    | 81         | 91  | 260 | 1,000            |
| CFR100 | CFR2WS    | 103        | 78  | 260 | 1,000            |
| CFR200 | CFR3WS    | 81         | 91  | 260 | 1,000            |
| CFR200 | CFR3WS    | 103        | 94  | 260 | 1,000            |

**BULK PACKING**

| Normal  | Miniature | Piece/Per Inner Box | Bag/Per Inner Box | Piece Per Bag |
|---------|-----------|---------------------|-------------------|---------------|
| CFR-12  | CFR25S    | 10,000              | 10                | 1,000         |
| CFR-25  | CFR50S    | 10,000              | 10                | 1,000         |
| CFR-50  | CFR1WS    | 5,000               | 5                 | 1,000         |
| CFR-100 | CFR2WS    | 2,000               | 4                 | 500           |
| CFR200  | CFR3WS    | 1,000               | 2                 | 500           |

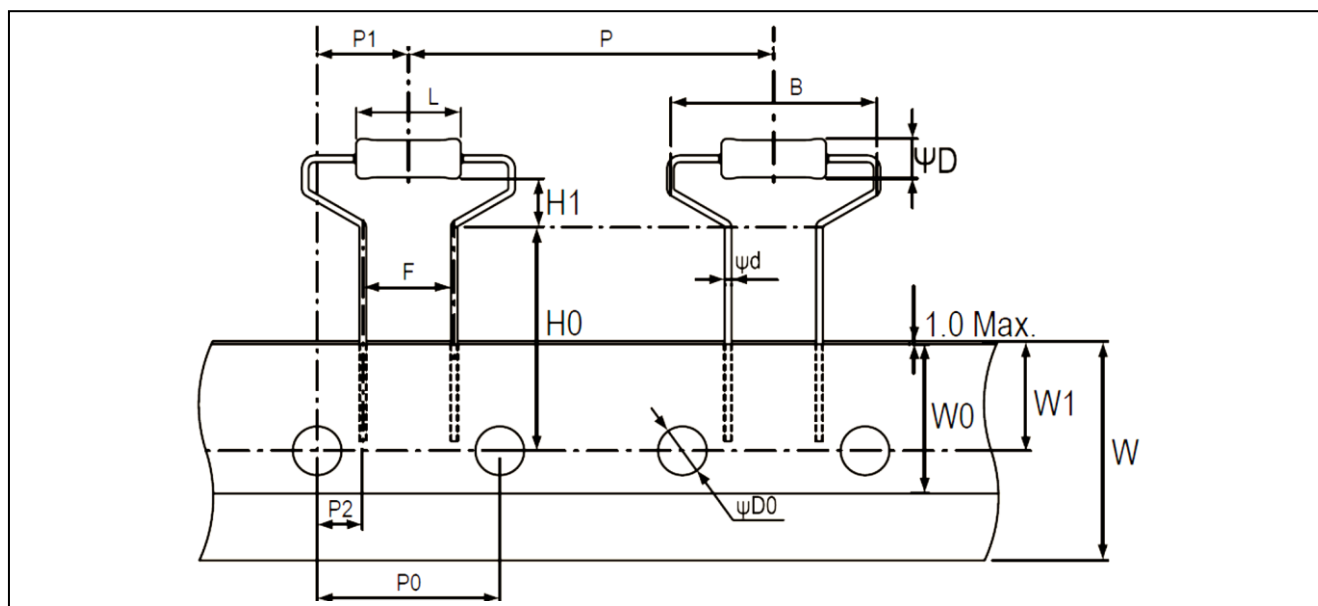
**FORMING****M TYPE**

| TYPE   |           | DIMENSIONS     |               |                 |              |              | Unit: mm |  |
|--------|-----------|----------------|---------------|-----------------|--------------|--------------|----------|--|
| Normal | Miniature | L              | $\psi D$      | $\psi d$        | P            | H            |          |  |
| CFR-12 | CFR25S    | $3.4 \pm 0.3$  | $1.9 \pm 0.2$ | $0.45 \pm 0.05$ | $6.0 \pm 1$  | $10.0 \pm 1$ |          |  |
| CFR-25 | CFR50S    | $6.3 \pm 0.5$  | $2.4 \pm 0.2$ | $0.55 \pm 0.05$ | $10.0 \pm 1$ | $10.0 \pm 1$ |          |  |
| CFR-50 | CFR1WS    | $9.0 \pm 0.5$  | $3.3 \pm 0.3$ | $0.55 \pm 0.05$ | $12.5 \pm 1$ | $10.0 \pm 1$ |          |  |
| CFR100 | CFR2WS    | $11.5 \pm 1.0$ | $4.5 \pm 0.5$ | $0.8 \pm 0.05$  | $15.0 \pm 1$ | $12.5 \pm 1$ |          |  |
| CFR200 | CFR3WS    | $15.5 \pm 1.0$ | $5.0 \pm 0.5$ | $0.8 \pm 0.05$  | $20.0 \pm 1$ | $15.0 \pm 1$ |          |  |

**MB TYPE**

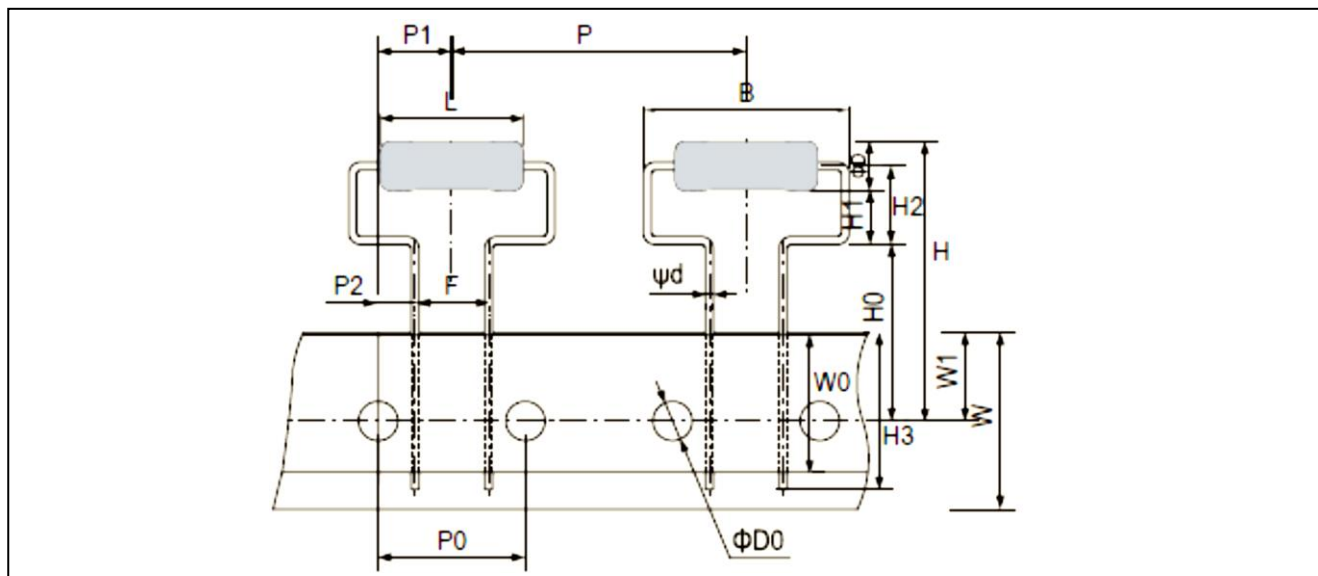
| TYPE   |           | DIMENSIONS     |               |                 |              |              | Unit: mm    |               |  |
|--------|-----------|----------------|---------------|-----------------|--------------|--------------|-------------|---------------|--|
| Normal | Miniature | L              | $\psi D$      | $\psi d$        | P            | H1           | H2          | t             |  |
| CFR-25 | CFR50S    | $6.3 \pm 0.5$  | $2.4 \pm 0.2$ | $0.55 \pm 0.05$ | $10.0 \pm 1$ | $6.0 \pm 1$  | $5.0 \pm 1$ | $1.2 \pm 0.2$ |  |
| CFR-50 | -         | $9.0 \pm 0.5$  | $3.3 \pm 0.3$ | $0.55 \pm 0.05$ | $12.5 \pm 1$ | $6.0 \pm 1$  | $5.0 \pm 1$ | $1.2 \pm 0.2$ |  |
| -      | CFR1WS    | $9.0 \pm 0.5$  | $3.3 \pm 0.3$ | $0.8 \pm 0.05$  | $12.5 \pm 1$ | $6.0 \pm 1$  | $5.0 \pm 1$ | $1.4 \pm 0.2$ |  |
| CFR100 | CFR2WS    | $11.5 \pm 1.0$ | $4.5 \pm 0.5$ | $0.8 \pm 0.05$  | $15.0 \pm 1$ | $6.0 \pm 1$  | $5.0 \pm 1$ | $1.4 \pm 0.2$ |  |
| CFR200 | CFR3WS    | $15.5 \pm 1.0$ | $5.0 \pm 0.5$ | $0.8 \pm 0.05$  | $20.0 \pm 1$ | $10.0 \pm 1$ | $5.0 \pm 1$ | $1.4 \pm 0.2$ |  |

## MHA TYPE



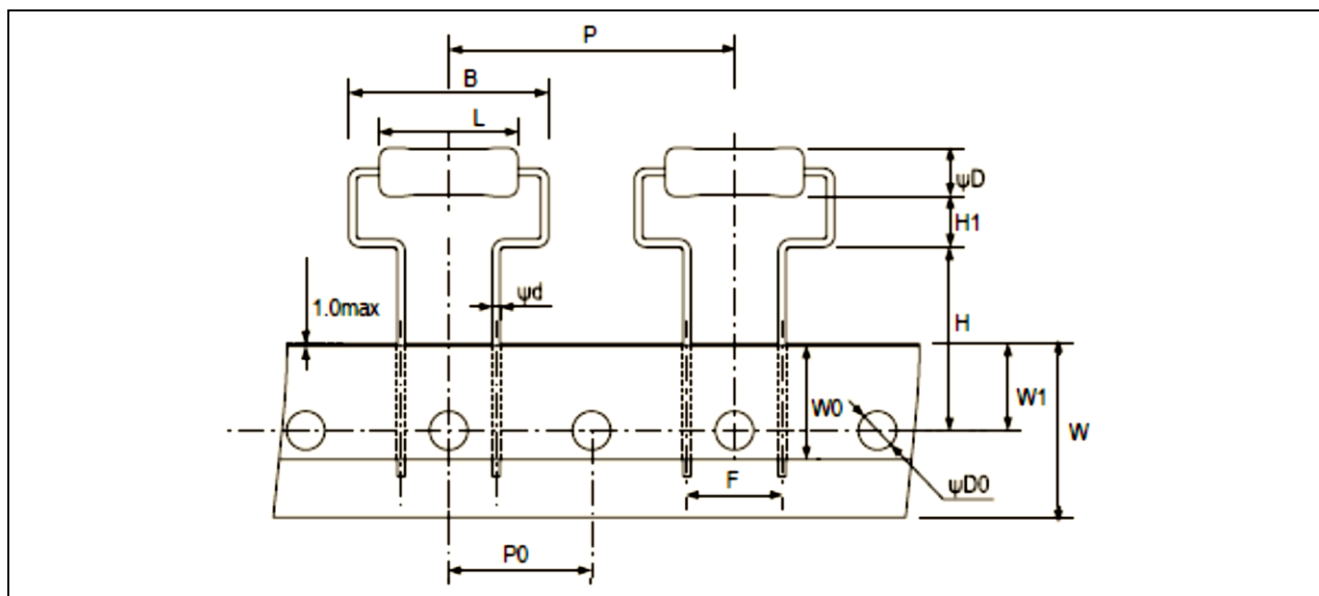
| TYPE   |           | DIMENSIONS |          |           |          |          |         |           |          | Unit: mm |
|--------|-----------|------------|----------|-----------|----------|----------|---------|-----------|----------|----------|
| Normal | Miniature | L          | $\psi D$ | $\psi d$  | B        | H0       | H1      | P         | P0       |          |
|        |           | 9.0±0.5    | 3.3±0.3  | 0.55±0.05 | 17.5Max  | 19.0±1.0 | 4.0±1.0 | 30.0±1.0  | 15.0±0.3 |          |
| CFR-50 | CFR1WS    | P1         | P2       | F         | W        | W0       | W1      | $\psi D0$ |          |          |
|        |           | 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



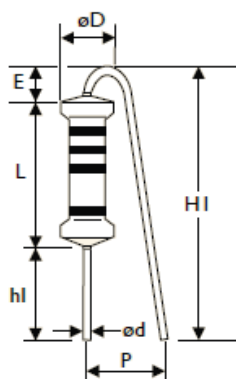
| TYPE   |           | DIMENSIONS |          |          |          |         |          |           |         | Unit: mm |
|--------|-----------|------------|----------|----------|----------|---------|----------|-----------|---------|----------|
| Normal | Miniature | L          | ψD       | ψd       | 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.   |
| CFR200 | CFR3WS    | 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

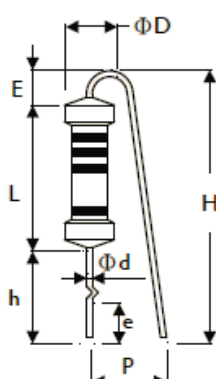


| TYPE   |           | DIMENSIONS |          |          |          |          |          |          |          | Unit: mm |
|--------|-----------|------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Normal | Miniature | L          | ψD       | ψd       | 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 |          |
| CFR200 | CFR3WS    | F          | W        | W0       | W1       | ψD0      |          |          |          |          |
|        |           | 10.0±0.5   | 18.0±0.5 | 5.0Min.  | 9.0±0.5  | 4.0±0.2  |          |          |          |          |

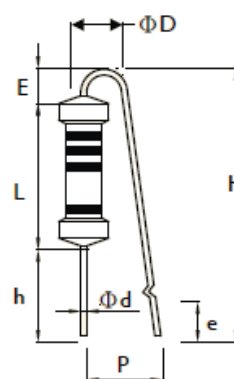
F TYPE



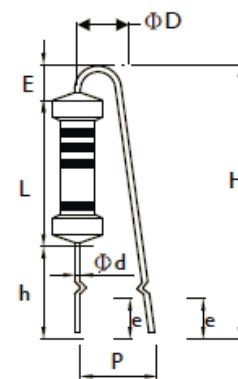
FK TYPE



FFK TYPE



FKK TYPE



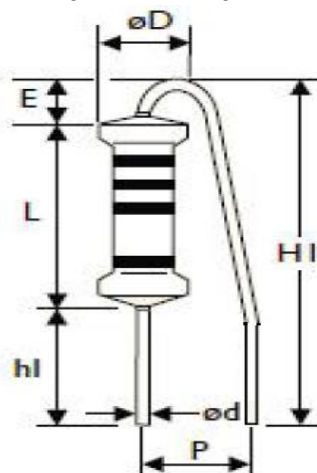
TYPE

DIMENSIONS

Unit: mm

| Normal | Miniature | L       | $\psi D$ | $\psi d$  | P   | h   | H<br>Max. | hl  | HI<br>Max. | E<br>Max. | e     |
|--------|-----------|---------|----------|-----------|-----|-----|-----------|-----|------------|-----------|-------|
| CFR-50 | CFR1WS    | 9.0±0.5 | 3.3±0.3  | 0.55±0.05 | 6±1 | 8±1 | 22        | 5±1 | 18.5       | 3.5       | 3.5±1 |
| CFR100 | CFR2WS    | 11.5±1  | 4.5±0.5  | 0.8±0.05  | 6±1 | 8±1 | 24        | 5±1 | 20         | 3.5       | 3.5±1 |
| CFR200 | CFR3WS    | 15.5±1  | 5.0±0.5  | 0.8±0.05  | 8±1 | 8±1 | 28        | 5±1 | 25         | 3.5       | 3.5±1 |

FB- TYPE (for -25&amp;50S)



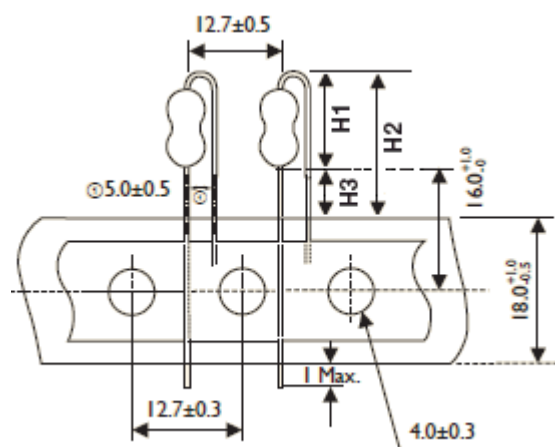
TYPE

DIMENSIONS

Unit: mm

| Normal | Miniature | L         | $\psi D$  | $\psi d$    | P   | hl      | HI       | E<br>Max. |
|--------|-----------|-----------|-----------|-------------|-----|---------|----------|-----------|
| CFR-25 | CFR50S    | 6.3 ± 0.5 | 2.4 ± 0.2 | 0.55 ± 0.05 | 6±1 | 5.5±0.5 | 13.5±0.5 | 3.5       |

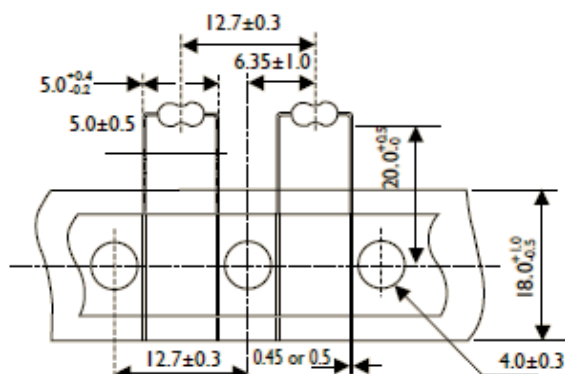
## FT TYPE (Taping Pack)



| TYPE   |           | DIMENSIONS |            |            | Unit: mm |
|--------|-----------|------------|------------|------------|----------|
| Normal | Miniature | H1<br>Max. | H2<br>Max. | H3<br>Max. |          |
| CFR-25 | CFR50S    | 10         | 18.5       | 8.5        |          |
| CFR-50 | CFR1WS    | 13         | 21.5       | 8.5        |          |
| CFR100 | CFR2WS    | 16         | 24.5       | 8.5        |          |

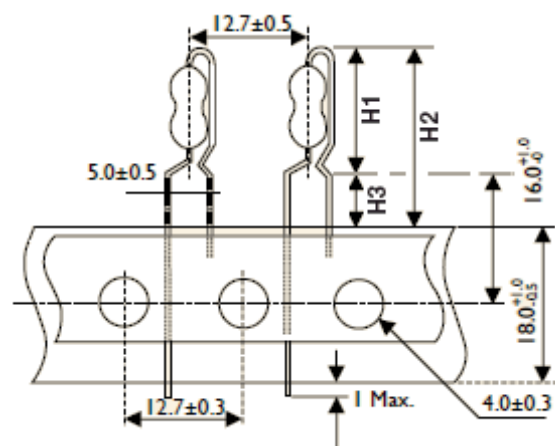
## MT TYPE (Taping Pack)

Rated Watts : 1/6W,1/4WS

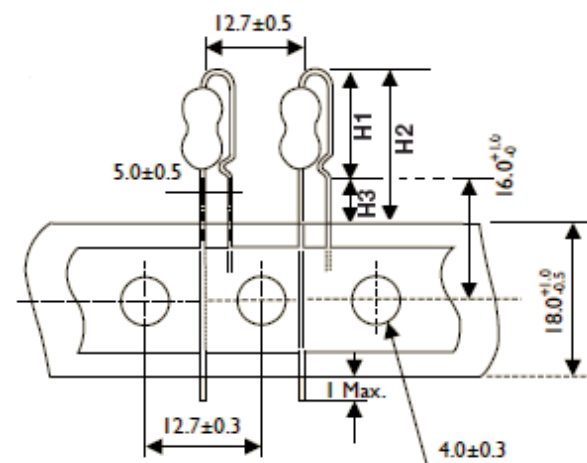


## AV TYPE (Taping Pack)

## PN TYPE (Taping Pack)



| TYPE   |           | DIMENSIONS |            |            | Unit: mm |
|--------|-----------|------------|------------|------------|----------|
| Normal | Miniature | H1<br>Max. | H2<br>Max. | H3<br>Max. |          |
| CFR-25 | CFR50S    | 13         | 21.5       | 8.5        |          |
| CFR-50 | CFR1WS    | 17         | 25.5       | 8.5        |          |
| CFR100 | CFR2WS    | 19         | 27.5       | 8.5        |          |



| TYPE   |           | DIMENSIONS |            |            | Unit: mm |
|--------|-----------|------------|------------|------------|----------|
| Normal | Miniature | H1<br>Max. | H2<br>Max. | H3<br>Max. |          |
| CFR-25 | CFR50S    | 11.5       | 20         | 8.5        |          |
| CFR-50 | CFR1WS    | 14.5       | 23         | 8.5        |          |
| CFR100 | CFR2WS    | 17.5       | 26         | 8.5        |          |

**MARKING**

4-BAND-CODE

±2%, ±5%

| COLOR  | 1st BAND | 2nd BAND | 3rd BAND | MULTIPLIER | TOLERANCE   |
|--------|----------|----------|----------|------------|-------------|
| BLACK  | 0        | 0        | 0        | 1Ω         |             |
| BROWN  | 1        | 1        | 1        | 10Ω        |             |
| RED    | 2        | 2        | 2        | 100Ω       | ± 2% ( G )  |
| 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      |             |

**REVISION HISTORY**

| REVISION  | DATE         | CHANGE NOTIFICATION | DESCRIPTION                         |
|-----------|--------------|---------------------|-------------------------------------|
| Version 0 | Aug.2, 2021  | -                   | - First issue of this specification |
| Version 1 | Aug.31, 2021 | -                   | - Add FB- forming code to -25&50S   |

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