# Approval Sheet

for

# Carbon Film Resistors
# General Type

# CFR series

## ±2% & ±5%

**YAGEO CORPORATION**

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| Rev. | Description | Issue Date | Drawn | Approved |
|---|---|---|---|---|
| 00 | issue new spec. | Jul 16, 2007 | Sara Lin | Joyce Chung |
| 01 | Add new lead dia for 52.4mm | Nov 8, 2007 | Lynn Chen | Joyce Chung |
| 02 | New lead dia is included(F:φd≥0.6mm) | Jan 31, 2008 | Lynn Chen | Joyce Chung |
| 03 | Add special forming type(52H) | Apr 22, 2009 | Lynn Chen | Ken Hsu |
| 04 | The environmental characteristics are adjusted. | Jan 11, 2011 | Feng Ye | Ken Hsu |
| 05 | "MB", "MR" forming types are included | Jul 14, 2011 | Feng Ye | Ken Hsu |
| 06 | "62-" special type is included | Dec 05, 2011 | Feng Ye | Ken Hsu |
| 07 | Revise the applicable range of PN & AV types forming for taping. | Mar 07, 2012 | Feng Ye | Ken Hsu |
| 08 | 26A &26C types are included | Mar 29, 2012 | Feng Ye | Ken Hsu |
| 09 | Revise S.T.O test description | Mar 31, 2012 | Feng Ye | Ken Hsu |
| 10 | Dimension h of FK&FFK&FKK types is revised; "62-" special type is deleted; | May 31, 2013 | Feng Ye | Flora Shen |
| 11 | Add "H" dimension for Short lead type for CFR200&CFR3WS types | Jun.24, 2014 | Feng Ye | Flora Shen |
| 12 | Revise forming pitch value from 6±1 to 8±1 for CFR200&CFR3WS types | Sep.22, 2014 | Feng Ye | Flora Shen |
| 13 | Revised the dia. of 52T type. Deleted the MR type. | Sep.23, 2015 | Feng Ye | Flora Shen |
| 14 | T-63 type is included | Aug.30, 2016 | Feng Ye | Flora Shen |
| 15 | Deleted 52T type. | Jun.12, 2018 | Mingfa Liu | Feng Ye |
| 16 | Revised the dimension "A" of tape on reel packing , Add dimension "B" for tape on reel packing. | Feb.25, 2020 | Mingfa Liu | Feng Ye |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Description | Carbon Film Resistors, General Type | | |
|---|---|---|---|
| Series | CFR | Rev. | 16 |

## 1. PRODUCT:

CARBON FILM RESISTORS-GENERAL TYPE
(Normal & Miniature Style)

## 2. PART NUMBER:

Part number of the carbon film resistor is identified by the name, power, tolerance, packing, temperature coefficient, special type and resistance value. The resistors are coated with layers of tan color lacquer.
Example:

| **CFR** | **-12** | **J** | **T** | **-** | **52H** | **100R** |
|---|---|---|---|---|---|---|
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| Series Name | Power Rating | Resistance Tolerance | Packing Style | Temperature Coefficient of Resistance | Special Type | Resistance Value |

(1) Style: CFR SERIES

(2) Power Rating: -12=1/6W、25S=1/4W、-25=1/4W、50S=1/2W、-50=1/2W、1WS=1W、100=1W、2WS=2W、200=2W 、3WS=3W

(3) Tolerance: G=±2% J=±5%

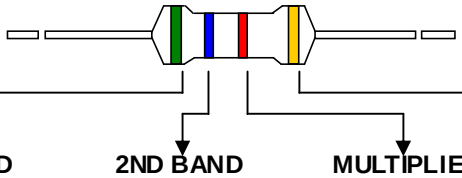
(4) Packaging Type: R = Paper Taping Reel
T = Tape on Box Packing
B = Bulk Packing

(5) Temperature Coefficient: "-"=Base on spec., see p.4 Table 1

(6) Special Type: 26- = 26mm, 52- = 52.4mm, 73- = 73mm
26A = 26mm with 0.4±0.02mm Φd
26C = 26mm with 0.5±0.02mm Φd
26G = 26mm with Φd ≥ 0.6mm
52A = 52.4mm with 0.4±0.02mm Φd
52B = 52.4mm with 0.45±0.02mm Φd
52C = 52.4mm with 0.5±0.02mm Φd
52G = 52.4mm with Φd ≥ 0.6mm
52H = 52.4mm without lacquer on soldering spots
63F = 63mm with 0.55±0.05mm Φd
73G = 73mm with Φd ≥ 0.6mm
M = M Type Forming for Bulk
MB=MB-Type Forming
F = F Type Forming for Bulk
FK = FK Type Forming
FFK = FFK Type Forming
FKK = FKK Type Forming
MT = MTsert ( rated watts -12 & 25s size only )
PN = PANAsert (rated watts from 1/4W to 2WS applicable only )
AV = Avlsert (rated watts from 1/4W to 2WS applicable only )

(7) Resistance Value: E24 Series
Example: 1R、10R、100R、10K、100K、330K、1M……

## 3. BAND-CODE:



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

## 4. ELECTRICAL CHARACTERISTICS

TABLE 1

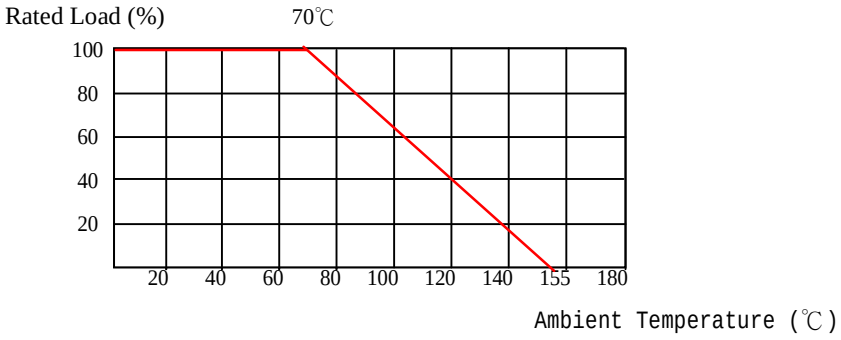
| STYLE | CFR-12 | CFR25S | CFR-25 | CFR50S | CFR-50 | CFR1WS | CFR100 | CFR2WS | CFR200 | CFR3WS |
|---|---|---|---|---|---|---|---|---|---|---|
| Power Rating at 70 ℃ | 1/6W | 1/4W | | 1/2W | | 1W | | 2W | | 3W |
| Maximum Working Voltage | 150V | 200V | 250V | 300V | 350V | 400V | 500V | | | |
| Maximum Overload Voltage | 300V | 400V | 500V | 600V | 700V | 800V | 1000V | | | |
| Voltage Proof | 300V | 400V | 500V | | | 700V | 1000V | | | |
| Resistance Range | 1Ω ~ 10MΩ & 0Ω for E24 series value | | | | | | | | | |
| Operating Temp. Range | - 55 ℃ to + 155 ℃ | | | | | | | | | |
| Temperature Coefficient | see Table. 2 | | | | | | | | | |

∗ Below or over this resistance on request.

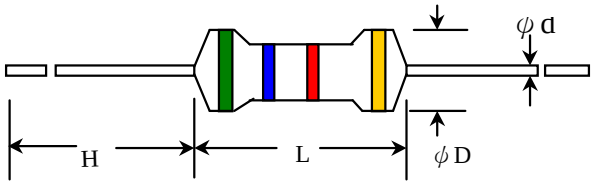
TABLE.2 TEMPERATURE COEFFICIENT

| STYLE | Max. Value of Temp. Coefficient ppm/℃ | | |
|---|---|---|---|
| | Under 100KΩ | 100K ~ 1MΩ | 1M ~ 10MΩ |
| CFR100, CFR200, CFR2WS CFR3WS | ± 350 | -500~0 | -1500~0 |
| CFR-12 , CFR-25 , CFR-50 CFR25S , CFR50S , CFR1WS | + 350 ~ - 500 | -700~0 | -1500~0 |

## 5. DERATING CURVE




## 6. DIMENSIONS




| STYLE | | DIMENSION | | | |
|---|---|---|---|---|---|
| Normal | Miniature | L | φ D | H | φ d |
| CFR-12 | CFR25S | 3.4±0.3 | 1.9±0.2 | 28±2.0 | 0.45±0.05 |
| CFR-25 | CFR50S | 6.3±0.5 | 2.4±0.2 | 28±2.0 | 0.55±0.05 |
| CFR-50 | CFR1WS | 9.0±0.5 | 3.3±0.3 | 26±2.0(T-52 type)<br>32±2.0(T-63F type) | 0.55±0.05 |
| CFR100 | CFR2WS | 11.5±1.0 | 4.5±0.5 | 35±2.0 (T-73 type)<br>25±2.0 (T-52 type) | 0.8±0.05 |
| CFR200 | CFR3WS | 15.5±1.0 | 5.0±0.5 | 33±2.0 | 0.8±0.05 |

## 7. ENVIRONMENTAL CHARACTERISTICS

(1) Short Time Over Load Test

At 2.5 times of the rated voltage or max. overload voltage for 5 seconds, whichever is less; the resistor should be free from defects after the resistor is released from load for about 30 minutes

Rated Voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$

The change of the resistance value should be within ± 0.75 % + 0.05Ω

(2) Voltage Proof

The resistor shall be clamped in the trough of a 90° metal V Block. Apply the insulation voltage specified in the “Table I “ between the terminals connected together with the block for about 60 seconds.
The resistor shall be able to withstand without breakdown or flashover.

(3) Temperature Coefficient Test

Test of resistors above room temperature 100°C ± 2°C ( Testing Temperature 115°C to 130°C ) at the constant temperature silicon plate for over 5 minutes. Then measure the resistance value.
The Temperature Coefficient is calculated by the following equation and its value should be within the range of requested.

$$\text{Resistor Temperature Coefficient} = \frac{R - R_0}{R_0} \times \frac{1}{t - t_0} \times 10^6$$

**R** = Resistance value under the testing temperature
**$R_0$** = Resistance value at the room temperature
**t** = The testing temperature
**$t_o$** = Room temperature

(4) Insulation Resistance

Apply "measuring voltage" between protective coating and termination for 1 min.,then measure. The measuring voltage shall be either 100V±15V d.c. for resistors with an insulation voltage lower than 500V or 500V±50V d.c. for resistors with an insulatin voltage equal to or greater than 500V.
The test resistance should be high than 1,000M ohm.

(5) Solderability

Immerse the specimen into the solder pot at 245 ± 5 °C for 3 ± 0.5 seconds.

At least 95% solder coverage on the termination.

(6) Solvent Resistance of Marking

The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 5± 0.5 minutes.

The specimen is no deterioration of coatings and color code.

(7) Robustness of Terminations

Direct Load – Resistors shall be held by one terminal and the load shall be gradually applied in the direction of the longitudinal axis of the resistor unit the applied load reached the requirement.

The load shall be held for 10 seconds. The load of weight shall be ≧ 2.5 kg ( 24.5N ).

(8) Damp Heat Steady State

Place the specimen in a test chamber at 40 ± 2 °C and 90 ~ 95 % relative humidity. Apply the 0.1 times rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 56 days.
The change of the resistance value shall be within ± 3.0 % + 0.05 Ω

(9) Endurance at 70 °C

Placed in the constant temperature chamber of 70 ± 3 °C the resistor shall be connected to the lead wire at the point of 25mm. Length with each terminal, the resistors shall be arranged not much effected mutually by the temperature of the resistors and the excessive ventilation shall not be performed, for 90 minutes on and 30 minutes off under this condition the rated D.C. voltage is applied continuously for 1000+48/-0 hours then left at no-load for 1hour, measured at this time the resistance value.

The change of the resistance value shall be within ± 3.0 % + 0.05 Ω.
There shall be no remarkable change in the appearance and the color code shall be legible after the test.

(10) Temperature Cycling Test

The temperature cycle shown in the following table shall be repeated 5 times consecutively. The measurement of the resistance value is done before the first cycle and after ending the fifth cycle, leaving in the room temperature for about 1 hour.

Temperature Cycling Conditions:

| Step | Temperature(°C) | Time (minute) |
|---|---|---|
| 1 | -40 ± 3 | 30 |
| 2 | 25 ± 3 | 10 ~ 15 |
| 3 | 155 ± 3 | 30 |
| 4 | 25 ± 3 | 10 ~ 15 |

The change of the resistance value shall be within ± 1.0 % + 0.05 Ω
After the test the resistor shall be free from the electrical or mechanical damage.

(11) Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at 260 ± 3 °C for 10 ± 1.0 seconds up to 2.5 ~ 3.5 mm.

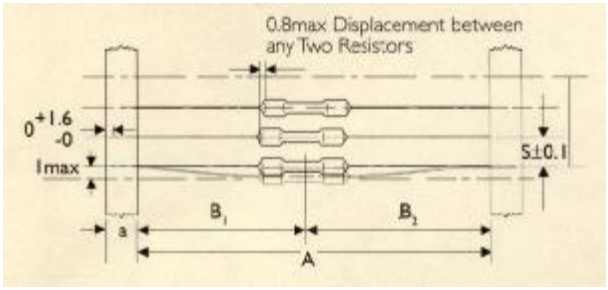
The change of the resistance value shall be within ± 1.0 % + 0.05 Ω

(12) Pulse Overload

Apply 4 times of rated voltage to the specimen at the 1 second on and 25 seconds off cycle, subjected to voltage application cycles specified in 10,000 time.
The change of the resistance value shall be within ± 1.0% + 0.05 Ω

## 8. PACKING METHODS

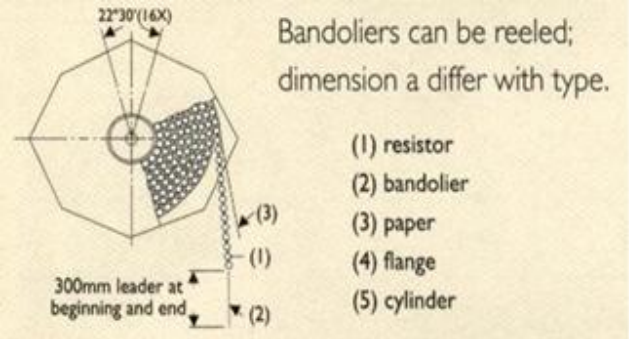
Bandolier for Axial leads

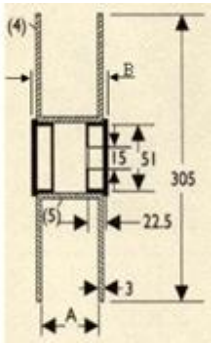



STYLE DIMENIONS Unit: ： mm

| Normal | Miniature | a | A | B1-B2 | S (spacing) | T (max. deviation of spacing) |
|---|---|---|---|---|---|---|
| CFR-12 | CFR25S | 6 ± 0.5 | 52.4 ± 1.0 | 1.2 | 5 | 1 mm per 10 spacing<br>0.5 mm per 5 spacing |
| | | | 26.0 ± 1.0 | 1.0 | | |
| CFR-25 | CFR50S | 6 ± 0.5 | 52.4 ± 1.0 | 1.2 | 5 | |
| | | | 26.0 ± 1.0 | 1.0 | | |
| CFR-50 | CFR1WS | 6 ± 0.5 | 52.4 ± 1.0 | 1.2 | 5 | |
| | | | 63.0 ± 1.0 | 1.5 | | |
| CFR100 | CFR2WS | 6 ± 0.5 | 73.0 ± 1.5 | 1.5 | 5 | |
| | | | 52.4 ± 1.0 | 1.2 | | |
| CFR200 | CFR3WS | 6 ± 0.5 | 73.0 ± 1.5 | 1.5 | 10 | |
| | | | 52.4 ± 1.0 | 1.2 | | |

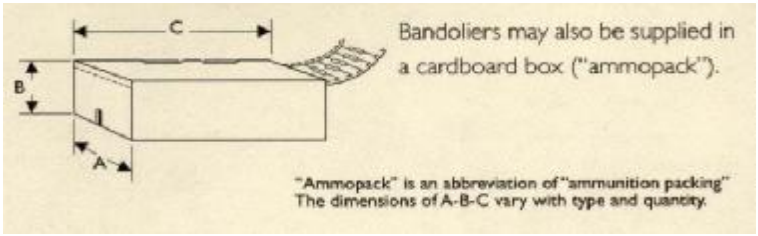
## 9. TAPE ON REEL PACKING




| STYLE | | TAPE ON REEL | | |
|---|---|---|---|---|
| Normal | Miniature | ACROSS FLANGE ( A ) | B | Qty 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 |

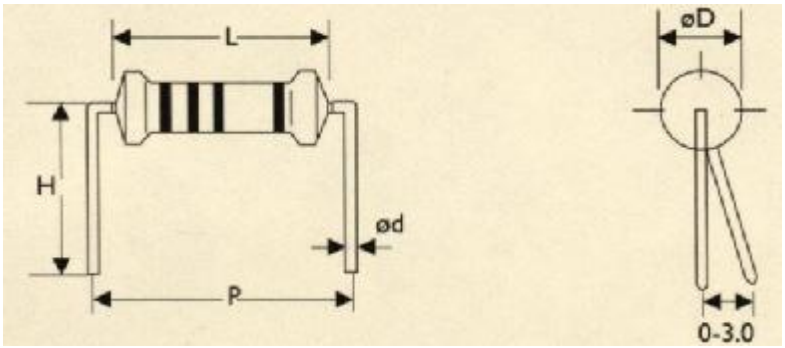
## 10. TAPE ON BOX PACKING




| STYLE | | Standard Lead Length | | | Short Lead Length | | | Qty per box |
|---|---|---|---|---|---|---|---|---|
| Normal | Miniature | W ( A ) | H ( B ) | L ( C ) | W ( A ) | H ( B ) | L ( C ) | |
| CFR-12 | CFR25S | 81 | 70 | 260 | 48 | 102 | 255 | 5,000 |
| CFR-25 | CFR50S | 81 | 104 | 260 | 48 | 102 | 255 | 5,000 |
| CFR-50 | CFR1WS | 73 | 45 | 258 | — | — | — | 1,000 |
| CFR100 | CFR2WS | 103 | 78 | 260 | 81 | 91 | 260 | 1,000 |
| CFR200 | CFR3WS | 103 | 94 | 260 | 81 | 91 | 260 | 1,000 |

## 11. SPECIAL TYPE ( FORMING DIMENSIONS )

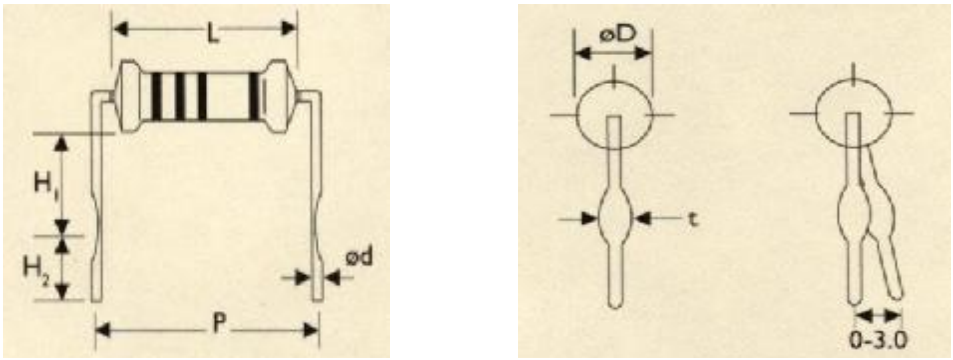
M TYPE




STYLE DIMENSIONS UNIT：mm

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

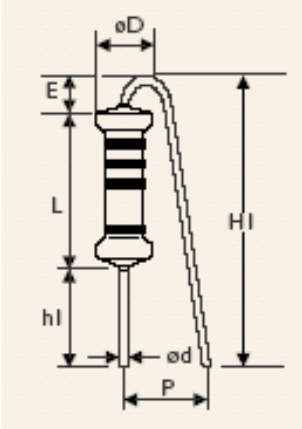
MB TYPE




STYLE DIMENSIONS UNIT：mm

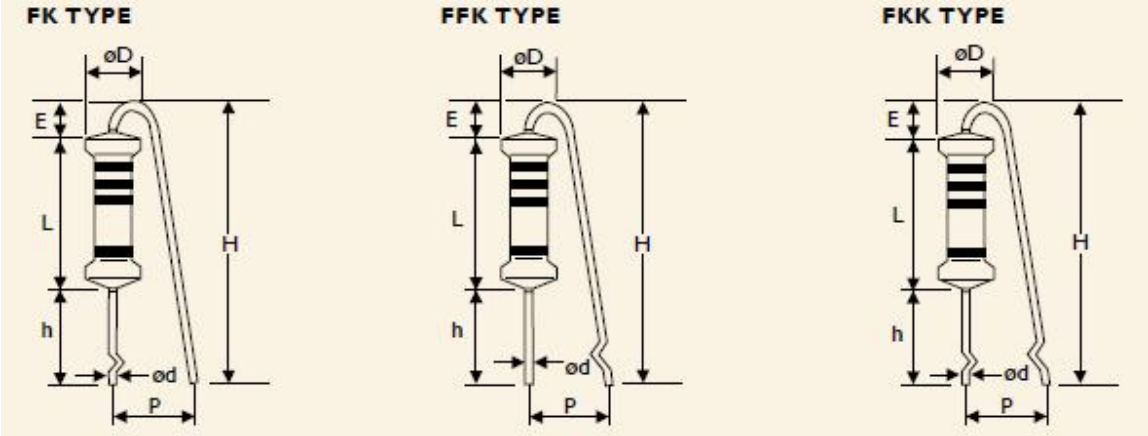
| Normal | Miniature | L | $\phi$ D | $\phi$ d | P | H 1 | H 2 | t |
|---|---|---|---|---|---|---|---|---|
| CFR-25 | CFR50S | 6.3 ± 0.5 | 2.4± 0.2 | 0.55 ± 0.05 | 10.0 ± 1 | 6.0 ± 1 | 5.0 ± 1 | 1.2 ± 0.2 |
| CFR-50 | CFR1WS | 9.0 ± 0.5 | 3.3± 0.3 | 0.55 ± 0.05 | 12.5 ± 1 | 6.0 ± 1 | 5.0 ± 1 | 1.2 ± 0.2 |
| CFR100 | CFR2WS | 11.5 ± 1.0 | 4.5 ± 0.5 | 0.8 ± 0.05 | 15.0 ± 1 | 6.0 ± 1 | 5.0 ± 1 | 1.4 ± 0.2 |
| CFR200 | CFR3WS | 15.5 ± 1.0 | 5.0 ± 0.5 | 0.8 ± 0.05 | 20.0 ± 1 | 10.0 ± 1 | 5.0 ± 1 | 1.4 ± 0.2 |

F TYPE




STYLE DIMENSIONS UNIT：mm

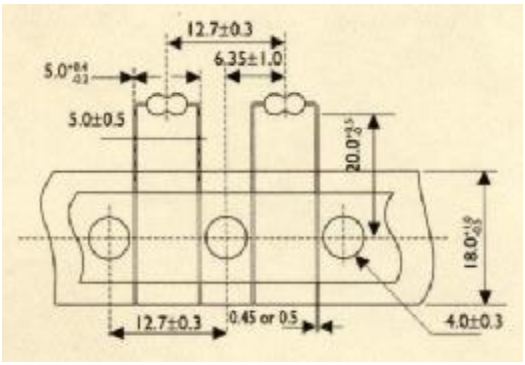
| Normal | Miniature | L | $\phi$ D | $\phi$ d | P | h1 | H1 max | E max |
|---|---|---|---|---|---|---|---|---|
| CFR100 | CFR2WS | 11.5 ± 1.0 | 4.5 ± 0.5 | 0.8 ± 0.05 | 6.0 ± 1 | 5.0 ± 1 | 20 | 3.5 |
| CFR200 | CFR3WS | 15.5 ± 1.0 | 5.0 ± 0.5 | 0.8 ± 0.05 | 8.0 ± 1 | 5.0 ± 1 | 25 | 3.5 |



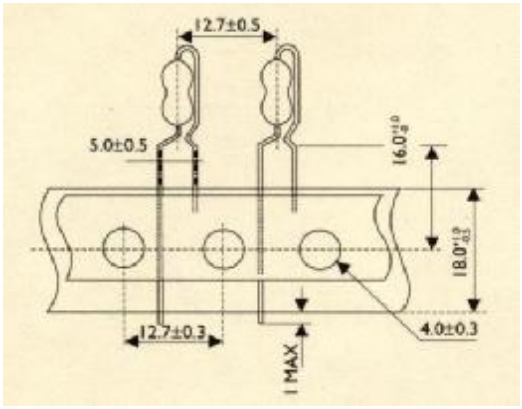

STYLE DIMENSIONS UNIT:mm

| Normal | Miniature | L | $\phi$ D | $\phi$ d | P | h | H max | E max |
|---|---|---|---|---|---|---|---|---|
| CFR100 | CFR2WS | 11.5 ± 1.0 | 4.5 ± 0.5 | 0.8 ± 0.05 | 6.0 ± 1 | 8.0 ± 1 | 25 | 3.5 |
| CFR200 | CFR3WS | 15.5 ± 1.0 | 5.0 ± 0.5 | 0.8 ± 0.05 | 8.0 ± 1 | 8.0 ± 1 | 30 | 3.5 |

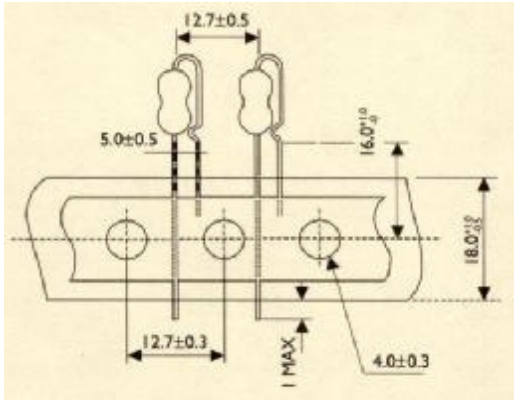
MT Type Forming for Taping ( Rated Watts -12 & 25S size only )




PN Type Forming for Taping (rated watts from 1/4W to 2WS applicable only )




AV Type Forming for Taping (rated watts from 1/4W to 2WS applicable only )



## 12. Plant Address

A. China Dongguan Plant
7-1, Gaoli Road, Gaoli Industrial Zone
Tangxia Zhen, Dongguan, Guangdong, China
(廣東省東莞市塘廈鎮高麗工業區高麗路 7-1 號)
Tel. 86-769-8772 0275
Fax. 86-769-8772 0275 #4333

B. China Suzhou Plant
No.158, Jinchang Road, No.1 Building of NanBangIND.Zone,
Mu Du New District, Suzhou, China
(江蘇省蘇州市木瀆新區金長路 158 號南濱工業區 1 號)
Tel. 86-512-66518889
Fax. 86-512-66519889