Approval Sheet

for

Carbon Film Resistors

CFN series

±2% & ±5%

YAGEO CORPORATION

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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	July 9, 2009	Lynn Chen	Ken Hsu

Description	Carbon Film Resistors		
Series	CFN	Rev.	00

1. PRODUCT:

CARBON FILM RESISTORS (Withstanding 85℃/85RH)

(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：

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

(1) Style： CFN SERIES

(2) Power Rating： -12=1/6W、25S=1/4W、-25=0.33W、50S=1/2W、-50=1/2W、1WS=1W、100=1W、2WS=2W、200=2W 、3WS=3W

(3) Tolerance： G=±2%　J=±5%

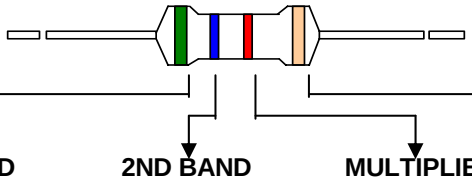
(4) Packaging Type：
R = Paper Taping Reel
T = Tape on Box Packing
B = Bulk Packing

(5) Temperature Coefficient： see p.4 Table 1

(6) Special Type：
26- = 26mm
26G = 26mm with Φd ≥ 0.6mm
52- = 52.4mm
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
52T = 52.4mm with 0.45±0.02mm Φd (CP wire)
73- = 73mm
73G = 73mm with Φd ≥ 0.6mm
M = M Type Forming for Bulk
F = F Type Forming for Bulk
FK = FK Type Forming
FFK = FFK Type Forming
FKK = FKK Type Forming
FT = FT Type Forming (rated watts -25 & 50S, -50 & 1WS size only)
MT = MTsert (rated watts -12 & 25S size only)
PN = PANAsert (rated watts -25 & 50S, -50 & 1WS size only)
AV = AVIsert (rated watts -25 & 50S & -50 & 1WS size 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

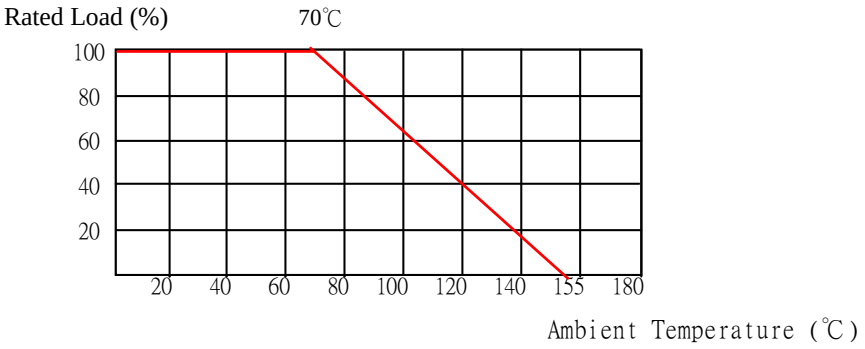
STYLE	CFN-12	CFN25S	CFN-25	CFN50S	CFN-50	CFN1WS	CFN100	CFN2WS	CFN200	CFN3WS
Power Rating at 70 ℃	1/6W	1/4W		1/2W		1W		2W		3W
Maximum Working Voltage	150V	200V	250V	300V	350V	400V	500V			
Maximum Overload Voltage	300V	400V	500V	600V	700V	800V	1000V			
Dielectric Withstanding Voltage	300V	400V	500V			700V	1000V			
Resistance Range	1RΩ ~ 10MΩ & 0Ω for E24 series value									
Operating Temp. Range	-55 ℃ to + 155 ℃									
Temperature Coefficient	see Table. 1									

∗ Below or over this resistance on request.

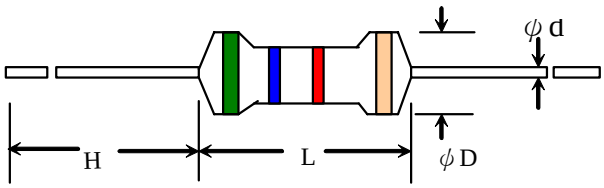
TABLE.1 TEMPERATURE COEFFICIENT

STYLE	Max. Value of Temp. Coefficient ppm/℃		
	Under 100KΩ	100K ~ 1MΩ	1M ~ 10MΩ
CFN100, CFN200, CFN2WS CFN3WS	± 350	-500	-1500
CFN-12 , CFN-25 , CFN-50 CFN25S , CFN50S , CFN1WS	+ 350 ~ - 500	-700	-1500

5. DERATING CURVE



6. DIMENSIONS



STYLE		DIMENSION			
Normal	Miniature	L	φD	H	φd
CFN-12	CFN25S	3.4±0.3	1.9±0.2	28±2.0	0.45±0.05
CFN-25	CFN50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
CFN-50	CFN1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
CFN100	CFN2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
CFN200	CFN3WS	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. (If the voltage exceeds the maximum load voltage, the maximum load voltage will be used as the rated voltage) applied for 5 seconds, the resistor should be free from defects after the resistor is released from load for about 30 minutes

Short Time Overload Voltage = $2.5 * \sqrt{\text{Power Rating} \times \text{Resistance Value}}$

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

(2) Dielectric Withstanding Voltage

The resistor is placed on the metal V Block. Apply a Table I dielectric withstanding 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
R0 = Resistance value at the room temperature
t = The testing temperature
t_o = Room temperature

(4) Insulation Resistance

Apply test terminal on lead and resistor body.
The test resistance should be high than 1,000M ohm.

(5) Solderability

Immerse the specimen into the solder pot at 260 ± 5 °C for 5 ± 0.5 seconds.
At least 95% solder coverage on the termination.

(6) Resistance to Solvent

The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 1 minutes.
The specimen is no deterioration of coatings and color code.

(7) Terminal Strength

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 reacheds 5 pounds。
The load shall be held for 10 seconds. The load of weight shall be ≧ 2.5 kg (24.5N).

(8) 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

(9) Load Life in Humidity

Place the specimen in a test chamber at 40 ± 2 °C and 90 ~ 95 % relative humidity. Apply the rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 1,000 hours
The change of the resistance value shall be within ± 3 % + 0.05 Ω

(10)Load Life Test

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 % + 0.05 Ω.
There shall be no remarkable change in the appearance and the color code shall be legible after the test.

(11)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	-55 ± 3	30
2	25 ± 3	2 ~3
3	155 ± 3	30
4	25 ± 3	2 ~3

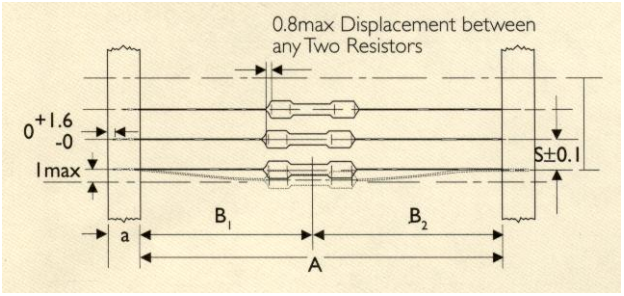
The change of the resistance value shall be within ± 1.0 % + 0.05 Ω
After the test the resistor shall be free from the electrical or mechanical damage.

(12)Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at 350 ± 10 °C for 3 ± 0.5 seconds up to 2 ~ 2.5 mm.
The change of the resistance value shall be within ± 1.0 % + 0.05 Ω

8. PACKING METHODS

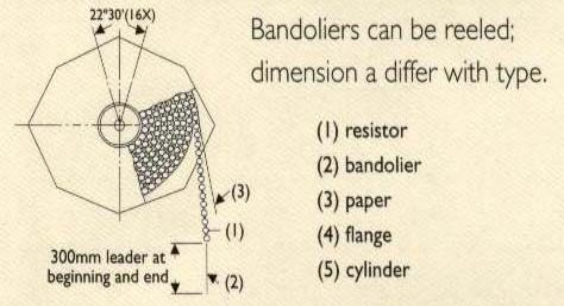
Bandolier for Axial leads

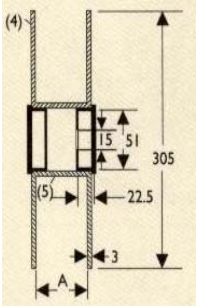


STYLE DIMENIONS Unit:：mm

Normal	Miniature	a	A	B1-B2	S (spacing)	T (max. deviation of spacing)
CFN-12	CFN25S	6 ± 0.5	52.4 ± 1.0	1.2	5	1 mm per 10 spacing 0.5 mm per 5 spacing
			26.0 ± 1.0	1.0		
CFN-25	CFN50S	6 ± 0.5	52.4 ± 1.0	1.2	5	
			26.0 ± 1.0	1.0		
CFN-50	CFN1WS	6 ± 0.5	52.4 ± 1.0	1.2	5	
CFN100	CFN2WS	6 ± 0.5	73.0 ± 1.5	1.5	5	
			52.4 ± 1.0	1.2		
CFN200	CFN3WS	6 ± 0.5	73.0 ± 1.5	1.5	10	
			52.4 ± 1.0	1.2		

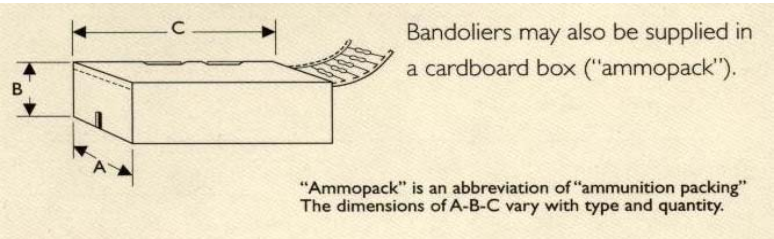
9. TAPE ON REEL PACKING





STYLE		TAPE ON REEL	
Normal	Miniature	ACROSS FLANGE (A)	Qty per reel
CFN-12	CFN25S	72	5,000
CFN-25	CFN50S	72	5,000
CFN-50	CFN1WS	72	2,500
CFN100	CFN2WS	95	2,000
CFN200	CFN3WS	95	1,000

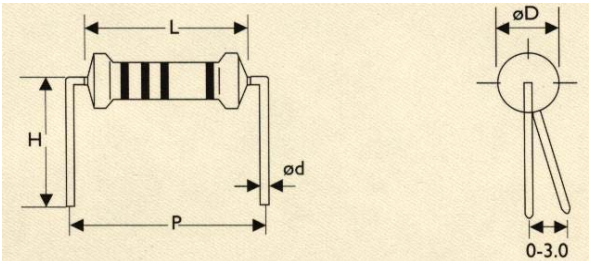
10. TAPE ON BOX PACKING



STYLE		Standard Lead Length			Short Lead Length			Qty per box
Normal	Miniature	W (A)	H (B)	L (C)	W (A)	H (B)	L (C)	
CFN-12	CFN25S	81	70	260	48	102	255	5,000
CFN-25	CFN50S	81	104	260	48	102	255	5,000
CFN-50	CFN1WS	73	45	258	———	———	———	1,000
CFN100	CFN2WS	103	78	260	81	91	260	1,000
CFN200	CFN3WS	103	94	260	81	91	260	1,000

11. SPECIAL TYPE (FORMING DIMENSIONS)

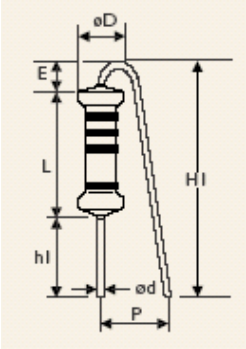
M TYPE



STYLE DIMENSIONS UNIT：mm

Normal	Miniature	L	ϕ D	ϕ d	P	H
CFN-12	CFN25S	3.4 ± 0.3	1.9 ± 0.2	0.45 ± 0.05	6.0 ± 1.0	10.0 ± 1
CFN-25	CFN50S	6.3 ± 0.5	2.4 ± 0.2	0.55 ± 0.05	10.0 ± 1.0	10.0 ± 1
CFN-50	CFN1WS	9.0 ± 0.5	3.3 ± 0.3	0.55 ± 0.05	12.5 ± 1.0	10.0 ± 1
CFN100	CFN2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	15.0 ± 1.0	12.5 ± 1
CFN200	CFN3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	20.0 ± 1.0	15.0 ± 1

F TYPE

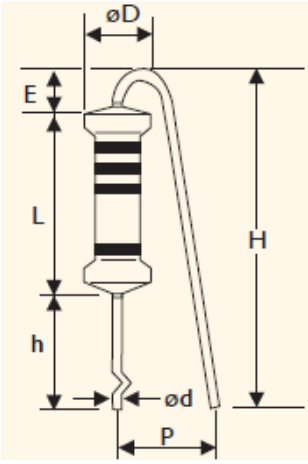


STYLE DIMENSIONS UNIT：mm

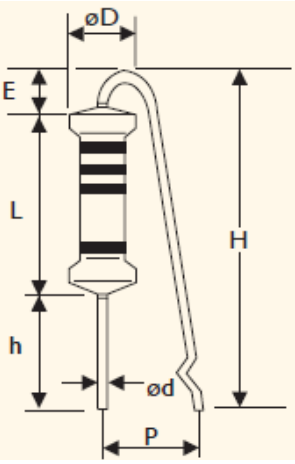
Normal	Miniature	L	ϕ D	ϕ d	P	h1	H1 max	E max
CFN100	CFN2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	6.0 ± 1	5.0 ± 1	20	3.5
CFN200	CFN3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	6.0 ± 1	5.0 ± 1	25	3.5

* CFN-25/50S is available

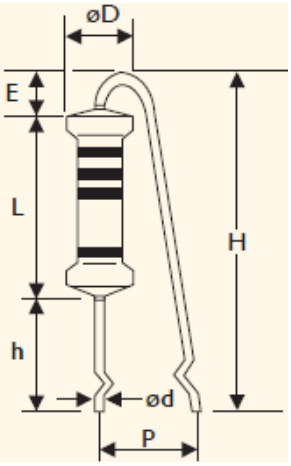
FK TYPE



FFK TYPE



FKK TYPE

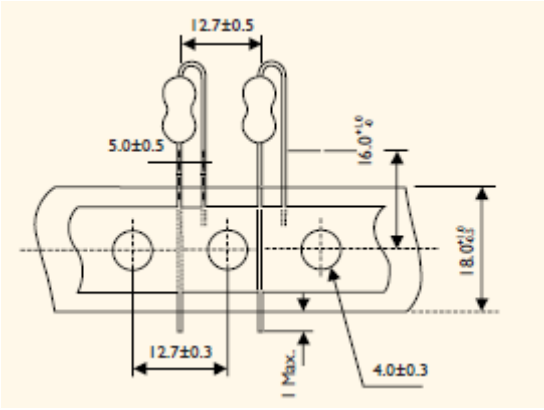


STYLE DIMENSIONS UNIT：mm

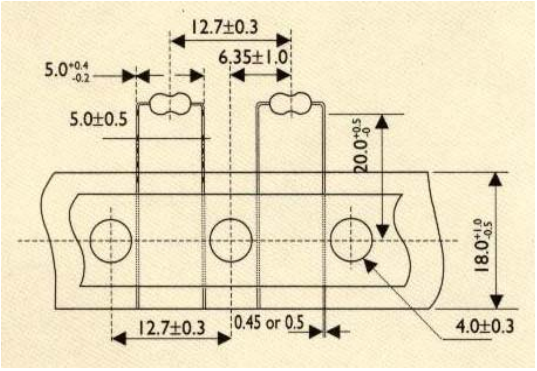
Normal	Miniature	L	ϕ D	ϕ d	P	h	H max	E max
CFN100	CFN2WS	11.5 ± 1.0	4.5 ± 0.5	0.8 ± 0.05	6.0 ± 1	10.0 ± 1	25	3.5
CFN200	CFN3WS	15.5 ± 1.0	5.0 ± 0.5	0.8 ± 0.05	6.0 ± 1	10.0 ± 1	30	3.5

* CFN-25/50S is available

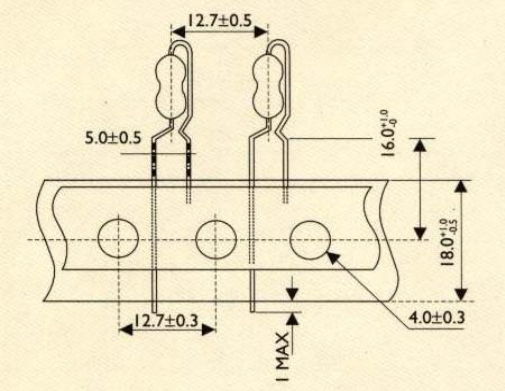
FT Type Forming for Taping (Rated Watts -25 & 50S, -50 & 1WS size only)



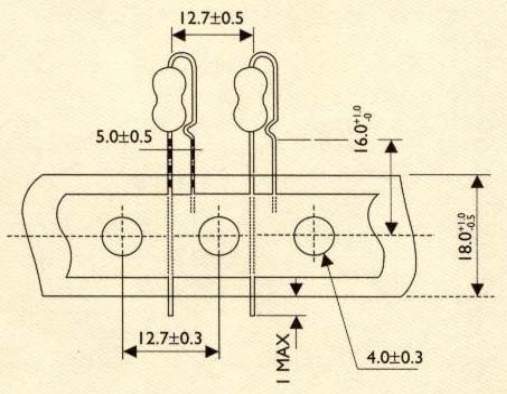
MT Type Forming for Taping (Rated Watts -12 & 25S size only)



PN Type Forming for Taping (Rated Watts -25 & 50S, -50 & 1WS size only)



AV Type Forming for Taping (Rated Watts -25 & 50S, -50 & 1WS size only)



12. Plant Address

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