

# Piezoelectronic Products

## Ceramic Resonators

### Lead

## FCR Series

### FEATURES

- The FCR series provide a high degree of stability between the quartz oscillator and the LC or RC oscillating circuits. Temperature characteristics:  $1 \times 10^{-5}/^{\circ}\text{C}$  ( $-20$  to  $+85^{\circ}\text{C}$ ).
- Highly miniaturized and lightweight, enabling the design of smaller oscillating circuits.
- Stable oscillation can be obtained without the time-consuming adjustment typically required with LC and RC oscillating circuits.
- Ideal for mass production applications because of adjustments are not required and cost is low.

### APPLICATIONS

VCRs, automotive electronics, copiers, telephones, facsimiles, calculators with printers, TV remote controls, and toys.

### PRODUCT IDENTIFICATION

FCR 4 MC5 A — T  
(1) (2) (3) (4) (5) (6)

(1) Series name

(2) Oscillating frequency [fo]

(3) Characteristics and shapes

| Symbol | Oscillating frequency | Circuit capacitance | Type    | Shapes/Dimensions |
|--------|-----------------------|---------------------|---------|-------------------|
| M2G    | 15 to 50MHz           | No built-in         | FCR-M2G | Fig.1             |
| M5     | 3.58 to 10MHz         | No built-in         | FCR-M5  | Fig.2             |
| MC5    | 3.58 to 10MHz         | Built-in            | FCR-MC5 | Fig.3             |

(4) Oscillating frequency tolerance

A:  $\pm 0.3\%$

Non:  $\pm 0.5\%$

(5) TDK internal code

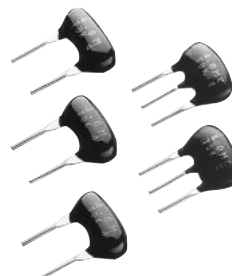
The frequency correlation between the IC and measuring circuits, the allowance, and other identifying factors are used, and the number of digits in the control code is different depending on the contents.

However, this control code is omitted from the "standard products".

\* Products with no frequency correlation, and an allowance of  $\pm 0.5\%$ .

(6) Lead shapes and packaging styles

|     | Straight lead | Taping |
|-----|---------------|--------|
| T   |               |        |
| Non | Straight lead | Bulk   |



### CHARACTERISTICS

|                                    |  |
|------------------------------------|--|
| Storage temperature range          | $-40$ to $+85^{\circ}\text{C}$                       |
| Operating temperature range        | $-40$ to $+85^{\circ}\text{C}$                       |
| Frequency tolerance                | $\pm 0.5\%$  |
| Temperature stability of frequency | $\pm 0.3\%$ [ $-40$ to $+85^{\circ}\text{C}$ ]       |
| Time stability                     | $\pm 0.3\%$ [over 10 years at $25^{\circ}\text{C}$ ] |

- Oscillating frequency can be adjusted using a designated circuit.
- The stability of the oscillating frequency is different depending on the IC being used. Please contact TDK for the exact oscillating conditions.

### RELIABILITY

| Item                                    | Specifications  | Test conditions   |
|---|---|---|
| Insulation resistance ( $M\Omega$ )min. | 100   | Between terminals, and between terminal and body  |
| DC withstand voltage Edc(V)             | 50[1min]  | Between terminals   |
| Terminal tensile strength               | No mechanical damage  | Terminal's axial direction: 4.9N<br>A direction $90^{\circ}$ to the axial direction: 2.45N  |
| Solder heat resistance                  | Oscillating frequency change: within $\pm 0.25\%$           | $260 \pm 5^{\circ}\text{C}$ , 10 $\pm 0.5$ s<br>$350 \pm 10^{\circ}\text{C}$ , 3 $\pm 0.5$ s<br>$270 \pm 5^{\circ}\text{C}$ , 3 $\pm 0.5$ s |
| Vibration                               | Resonant resistance change: within $\pm 10\Omega$           | Frequency: 10 to 55Hz<br>Amplitude: 1.52mm<br>X, Y, Z directions, 2h  |
| Acceleration                            |   | 100Gal<br>X, X', Y, Y', Z, Z'<br>6 directions $\times$ 3 times  |
| Solderability                           | More than 95% of the terminal shall be covered with solder. | $230 \pm 0.5^{\circ}\text{C}$ ,<br>3 $\pm 0.5$ s melted solder  |

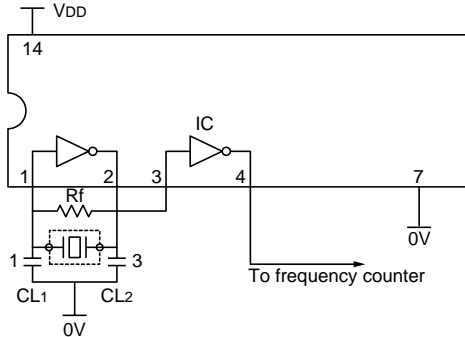
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### STANDARD TEST CIRCUIT



| Type    | Frequency range | IC name   | V <sub>DD</sub> | R <sub>f</sub> | CL <sub>1</sub> | CL <sub>2</sub> |
|---------|-----------------|-----------|-----------------|----------------|-----------------|-----------------|
| FCR-M5  | 3.58 to 7.99MHz | TC4069UBP | +5V             | 1MΩ            | 30pF            | 30pF            |
|         | 8 to 10MHz      | TC4069UBP | +5V             | 1MΩ            | 20pF            | 20pF            |
|         | 15 to 16.9MHz   | TC74HCU04 | +5V             | 1MΩ            | 30pF            | 30pF            |
| FCR-M2G | 17 to 19.9MHz   | TC74HCU04 | +5V             | 1MΩ            | 22pF            | 22pF            |
|         | 20 to 29.9MHz   | TC74HCU04 | +5V             | 1MΩ            | 15pF            | 15pF            |
|         | 30 to 39.9MHz   | TC74HCU04 | +5V             | 1MΩ            | 10pF            | 10pF            |
|         | 40 to 50MHz     | TC74HCU04 | +5V             | 1MΩ            | 5pF             | 5pF             |

### SHAPES AND DIMENSIONS

#### EXTERNAL LOAD

#### CAPACITANCE TYPE

#### FCR-M2G(15 to 50MHz)

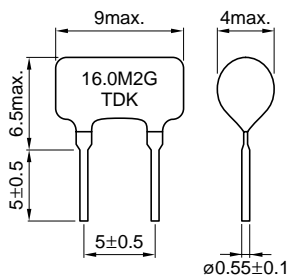


Fig. 1

#### FCR-M5(3.58 to 10MHz)

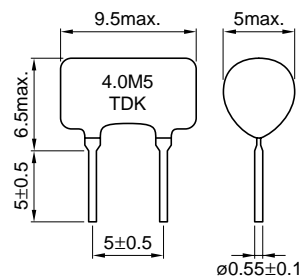


Fig. 2

#### BUILT-IN LOAD

#### CAPACITANCE TYPE

#### FCR-MC5(3.58 to 10MHz)

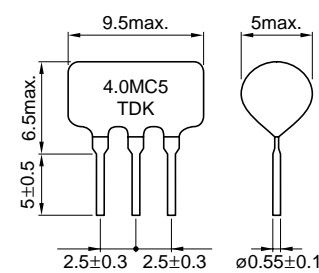
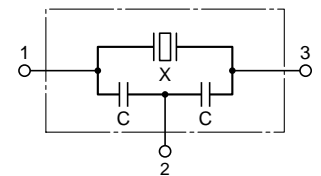


Fig. 3

#### CIRCUIT DIAGRAM



Dimensions in mm

### ELECTRICAL CHARACTERISTICS

| Part No.            | Fig. | Oscillating frequency | Oscillating frequency tolerance | Load capacitance C <sub>1</sub> , C <sub>2</sub> | Vibration mode                           |
|---------------------|------|-----------------------|---------------------------------|--|--|
| <b>FCR-M2G Type</b> |      |                       |                                 |  |  |
| FCR16.0M2G_*1_*2    | 1    | 16MHz                 | ±0.3, ±0.5%                     | 15pF   | Thickness direction expand oscillation   |
| FCR24.0M2G_ _       |      | 24MHz                 | ±0.3, ±0.5%                     | 10pF   |  |
| FCR32.0M2G_ _       |      | 32MHz                 | ±0.3, ±0.5%                     | 5pF  |  |
| FCR50.0M2G_ _       |      | 50MHz                 | ±0.3, ±0.5%                     | 5pF  |  |
| <b>FCR-M5 Type</b>  |      |                       |                                 |  |  |
| FCR4.0M5_ _         | 2    | 4MHz                  | ±0.3, ±0.5%                     | 30pF   | Shear oscillation in thickness direction |
| FCR4.19M5_ _        |      | 4.19MHz               | ±0.3, ±0.5%                     | 30pF   |  |
| FCR6.0M5_ _         |      | 6MHz                  | ±0.3, ±0.5%                     | 30pF   |  |
| FCR8.0M5_ _         |      | 8MHz                  | ±0.3, ±0.5%                     | 20pF   |  |
| FCR10.0M5_ _        |      | 10MHz                 | ±0.3, ±0.5%                     | 20pF   |  |
| <b>FCR-MC5 Type</b> |      |                       |                                 |  |  |
| FCR4.0MC5_ _        | 3    | 4MHz                  | ±0.3, ±0.5%                     | 30pF (Built-in capacitance)                      | Shear oscillation in thickness direction |
| FCR4.19MC5_ _       |      | 4.19MHz               | ±0.3, ±0.5%                     | 30pF (Built-in capacitance)                      |  |
| FCR6.0MC5_ _        |      | 6MHz                  | ±0.3, ±0.5%                     | 30pF (Built-in capacitance)                      |  |
| FCR8.0MC5_ _        |      | 8MHz                  | ±0.3, ±0.5%                     | 20pF (Built-in capacitance)                      |  |
| FCR10.0MC5_ _       |      | 10MHz                 | ±0.3, ±0.5%                     | 20pF (Built-in capacitance)                      |  |

\*1 \_: Please specify oscillating frequency tolerance

A: ±0.3%, Non: ±0.5%

\*2 \_: Please specify lead shapes and packaging styles

T: Straight lead/Taping

Non: Straight lead/Bulk

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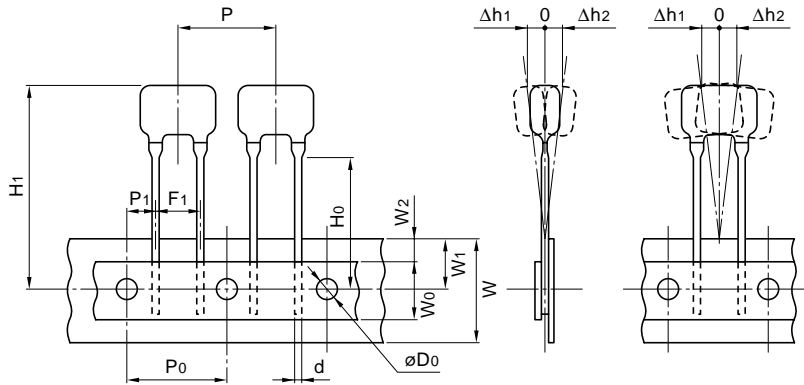
## FCR Series

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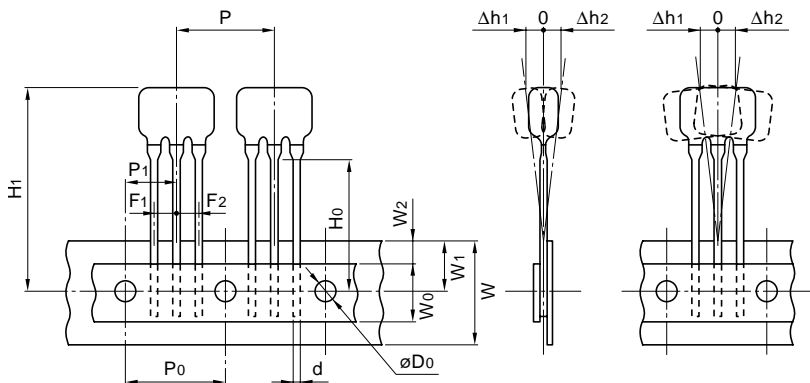
### Lead

#### TAPING SPECIFICATIONS

##### FCR-M2G, -M5 (Fig. 1)



##### FCR-MC5 (Fig. 2)



Dimensions in mm

| Type   | FCR-M2G, -M5     | FCR-MC5          |
|--|------------------|------------------|
| Fig.   | 1                | 2                |
| P  | 12.7±1           | 12.7±1           |
| P <sub>0</sub> * <sup>1</sup>                    | 12.7±0.3         | 12.7±0.3         |
| P <sub>1</sub>                                   | 3.85±1.3         | 3.85±1.3         |
| F <sub>1</sub> , F <sub>2</sub> * <sup>2</sup>   | 5±0.3            | 2.5±0.3          |
| W  | 18+1,-0.5        | 18+1,-0.5        |
| W <sub>0</sub>                                   | 11.5min.         | 11.5min.         |
| W <sub>1</sub>                                   | 9±0.5            | 9±0.5            |
| W <sub>2</sub>                                   | 5max.            | 5max.            |
| H <sub>0</sub> * <sup>3</sup>                    | 16±0.5/18+1.5,-0 | 16±0.5/18+1.5,-0 |
| D <sub>0</sub>                                   | ø4±0.2           | ø4±0.2           |
| Δh <sub>1</sub> , Δh <sub>2</sub> * <sup>4</sup> | 0±2°             | 0±2°             |
| d  | 0.55±0.1         | 0.55±0.1         |
| H <sub>1</sub>                                   | 30max.           | 30max.           |

\*<sup>1</sup> The cumulative pitch tolerance is ±1mm at 20 pitches.

\*<sup>2</sup> The measurement position is the top of the tape and between the leads.

\*<sup>3</sup> The measurement position is under the stopper.

16mm: PANAMOUNT

18mm: AVIMOUNT

\*<sup>4</sup> The measurement position is at a product of the top.