

**NEW**

## High Frequency Ceramic Capacitor

ISO 9002 CERTIFIED

### HFC Series

#### 1. Features

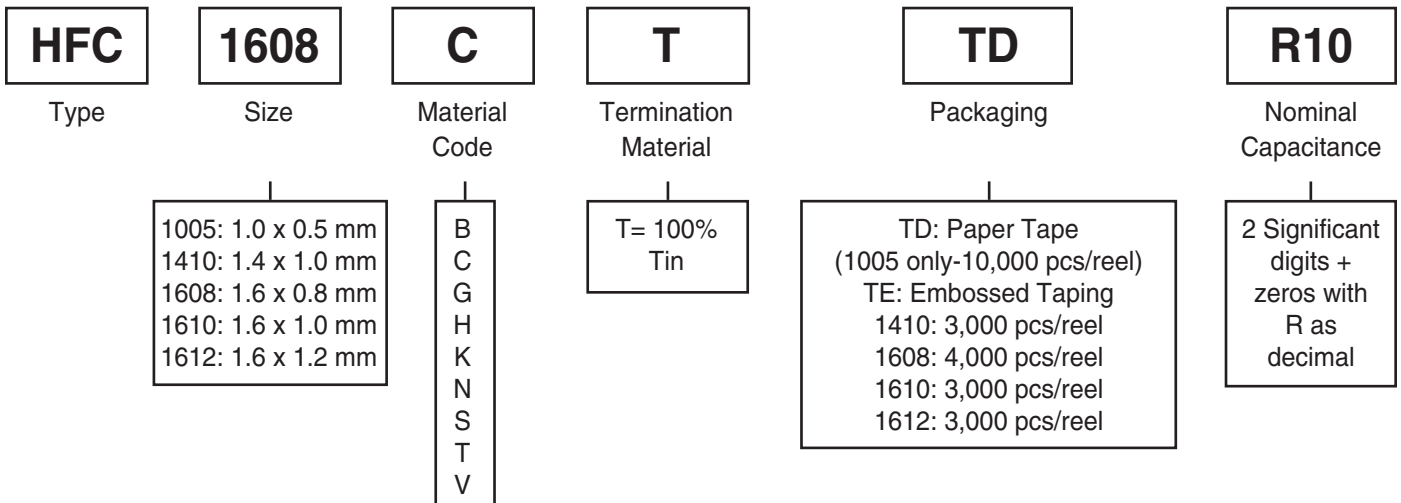
- Suitable for surface mounting. (Chip type)
- Low dielectric loss at high frequency. ( High Q)
- Narrow tolerance of capacitance
- Excellent temperature characteristics
- High reliability and no polarity by single layer ceramic substrate construction
- 0.10 ~ 1.10 pF available by 0.05 pF range (HFC1005 series)
- 0.10 ~ 1.20 pF available by 0.05 pF range (HFC1410, 1608, 1610, 1612 series)

#### 2. Applications

- Microwave circuit
- Mobile phone headset
- Others

#### 3. Type Designation

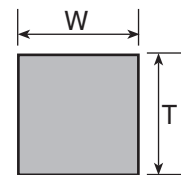
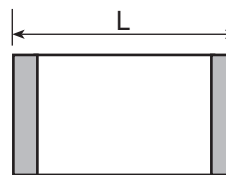
Type designation shall be as the following form.



#### 4. Dimensions

Table 1

Dimensions - inches (mm)			
Part	L	W	T
<b>1005</b>	0.039±0.006 (1.00±0.15)	0.020±0.004 (0.50±0.10)	0.020±0.004 (0.50±0.10)
<b>1410</b>	0.055±0.006 (1.40±0.15)	0.039±0.004 (1.00±0.10)	0.039±0.004 (1.00±0.10)



## 4. Dimensions Cont.

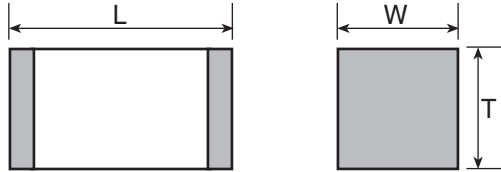


Table 1

Dimensions - inches (mm)			
Part	L	W	T
1608	0.063±0.006 (1.60±0.15)	0.031±0.004 (0.80±0.10)	0.028±0.008 (0.70±0.20)
1610	0.063±0.006 (1.60±0.15)	0.039±0.004 (1.00±0.10)	0.033±0.01 (0.85±0.25)
1612	0.063±0.006 (1.60±0.15)	0.047±0.004 (1.20±0.10)	0.043±0.008 (1.10±0.20)

## 5. Characteristics of Dielectric Materials

Table 2 - HFC1005 Series

Material Code	$\epsilon_r$	$\tau_f$ (ppm/°C)
T	37.0±1.5	0±10
N	70.0±3.0	6±10
K	92.0±2.0	6±10
V	113.0±5.0	30±10
H	140.0±3.0	0±30
G	160.0±4.0	0±30
S	180.0±4.0	0±30
B	200.0±5.0	0±30

Table 2 - HFC1410, 1608, 1610, 1612 Series

Material Code	$\epsilon_r$	$\tau_f$ (ppm/°C)
C	21.5±2.0	0±10
T	37.0±1.5	0±10
N	70.0±3.0	6±10
V	113.0±5.0	30±10

## 6. Standard Specifications

Ordering Code	Capacitance (pF)	Tolerance Code (pF)	Material Code	Rated Voltage DC(V)	Operating Temp. Range
HFC1005TTR10	0.10	±0.015	T	50	-55°C to 125°C
HFC1005TTR15	0.15				
HFC1005NTR20	0.20	±0.030	N		
HFC1005NTR25	0.25				
HFC1005KTR30	0.30				

## 6. Standard Specifications Cont.

Ordering Code	Capacitance (pF)	Tolerance Code (pF)	Material Code	Rated Voltage DC(V)	Operating Temp. Range	
HFC1005KTR35	0.35	±0.03	K	50	-55°C to 125°C	
HFC1005VTR40	0.40		V			
HFC1005VTR45	0.45					
HFC1005VTR50	0.50					
HFC1005VTR55	0.55					
HFC1005VTR60	0.60					
HFC1005HTR65	0.65					H
HFC1005HTR70	0.70					
HFC1005HTR75	0.75	±0.05	G			
HFC1005GTR80	0.80					
HFC1005GTR85	0.85					
HFC1005GTR90	0.90					
HFC1005GTR95	0.95					
HFC1005ST1R0	1.00					S
HFC1005BT1R1	1.10					B
HFC1410VT1R1	1.10	±0.075	V	50	-55°C to 125°C	
HFC1410VT1R2	1.20					
HFC1410VT1R3	1.30					
HFC1608CTR10	0.10	±0.015	C	50	-55°C to 125°C	
HFC1608TTR15	0.15		T			
HFC1608NTR20	0.20	±0.03	N			
HFC1608NTR25	0.25					
HFC1608NTR30	0.30					
HFC1608NTR35	0.35					
HFC1608VTR40	0.40		V			
HFC1608VTR45	0.45					
HFC1608VTR50	0.50					
HFC1608VTR55	0.55					

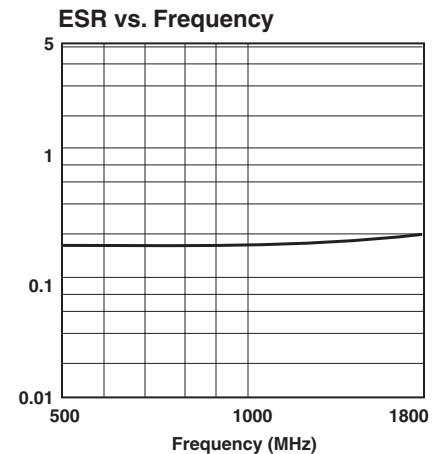
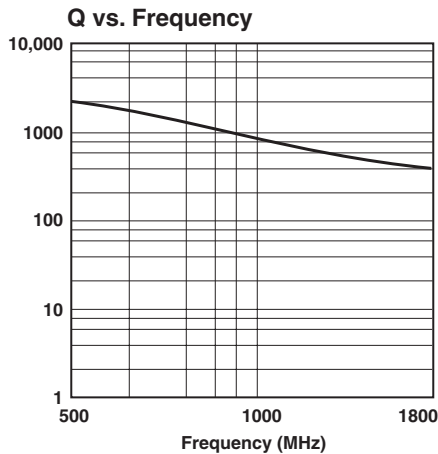
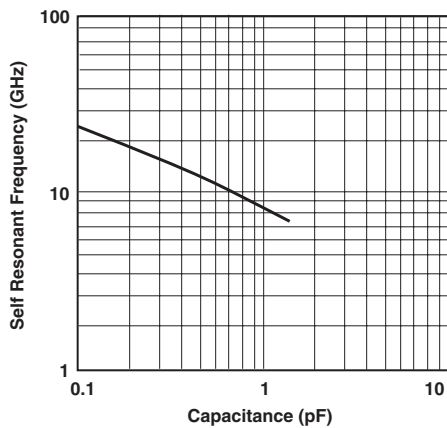
## 6. Standard Specifications Cont.

Ordering Code	Capacitance (pF)	Tolerance Code (pF)	Material Code	Rated Voltage DC(V)	Operating Temp. Range
HFC1610VTR60	0.60	±0.03	V	50	-55°C to 125°C
HFC1610VTR65	0.65				
HFC1610VTR70	0.70	±0.05			
HFC1610VTR75	0.75				
HFC1610VTR80	0.80				
HFC1610VTR85	0.85				
HFC1610VTR90	0.90				
HFC1612VTR95	0.95	±0.05	V	50	-55°C to 125°C
HFC1612VT1R0	1.00				

## 8. Self Resonant Frequency (SRF) vs. Capacitance Value

HFC1410, 1608, 1610, 1612, series

Type: HFC1612VT1R0R05M50 (1.0 pF)

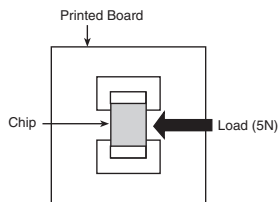
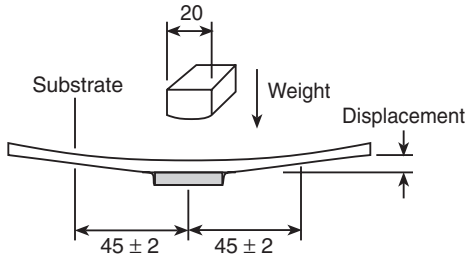


## 9. Characteristics

### 9-1 Electrical Characteristics

Item	Requirement	Conditions
Capacitance	Within the specified tolerances of parts	<b>Frequency:</b> 1 MHz <b>Voltage:</b> 1 Vrms <b>Instrument:</b> YHP4278A
Q Value	100 or more	<b>Frequency:</b> 1 MHz <b>Voltage:</b> 1 Vrms <b>Instrument:</b> YHP4278A
Insulation Resistance	10,000 MΩ or more	<b>Test Voltage:</b> Rated Voltage <b>Electrification Time:</b> 60 ± 5 sec
Breakdown Voltage	No break down	<b>Test Voltage:</b> 300% of the Rated Voltage <b>Electrification Time:</b> 1 to 5 sec <b>Limit Surge Current:</b> 50 mA or less

### 9-2 Mechanical Characteristics

Item	Requirement	Conditions
Adhesion of Electrodes	No mechanical damage	A static load of 5N(0.5 kgf) shall be applied in the direction of the arrow as follows 
Core Body Strength	No mechanical damage	A static load of 5N(0.5 kgf) using a R 0.5 pressure rod shall be applied on the core of the component and held for 10 sec
Substrate Bending Test	<b>Visual Examination:</b> No mechanical damage <b>Capacitance:</b> Within ± 2.0% or ± 0.02 pF whichever is more <b>Q Value:</b> 100 or more <b>Insulation Resistance:</b> 10,000 MΩ or more	Solder a specimen to the substrate and bend it. (Displacement: 2mm) 

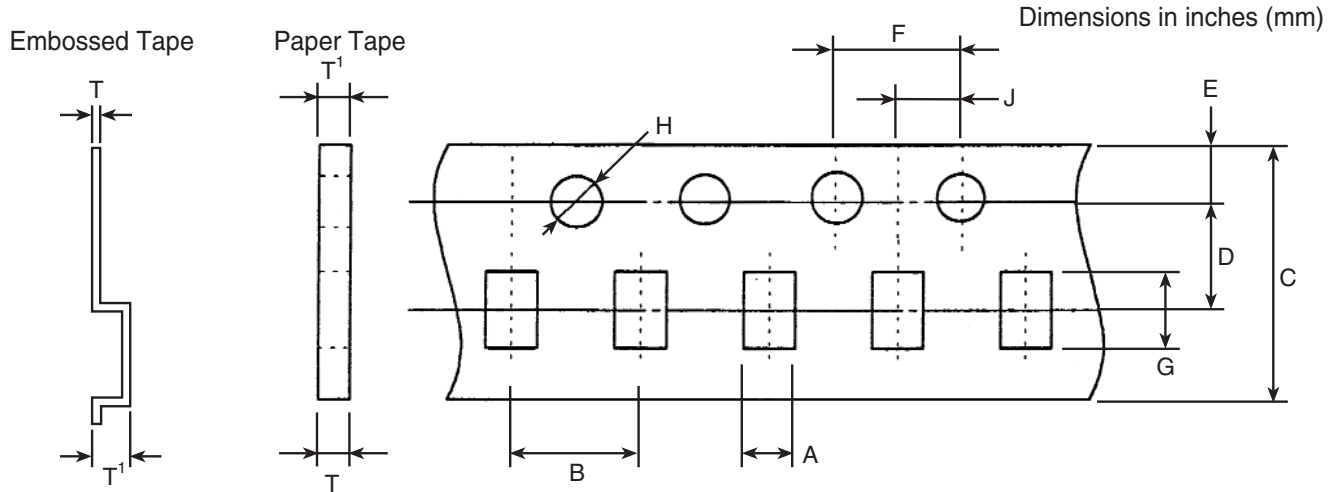
## 9-3 Endurance Characteristics

Item	Requirement	Conditions
Solderability	A new coating of solder shall cover a minimum of 95% of the surface being immersed	<b>Flux:</b> 25 wt% colophony <b>Solder:</b> H60A (Silver 3%) <b>Preheating:</b> 150°C for 1 min <b>Soldering Temperature:</b> 230 ± 5°C <b>Soldering Temperature:</b> 215 ± 5°C (MC1005) <b>Immersion Time:</b> 3 ± 1 sec
Resistance to Soldering Heat	<b>Visual Examination:</b> No mechanical damage <b>Capacitance:</b> Within ± 2.0% or ± 0.02 pF whichever is more <b>Q Value:</b> 100 or more <b>Insulation Resistance:</b> 10,000 MΩ or more	<b>Flux:</b> 25 wt% colophony <b>Solder:</b> H60A (Silver 3%) <b>Soldering Temperature:</b> 270 ± 5°C <b>Immersion Time:</b> 10 ± 1 sec
Resistance to Humidity (Load Test)		<b>Temperature:</b> 60 ± 2°C <b>Relative Humidity:</b> 95% RH <b>Test Voltage:</b> Rated Voltage <b>Test Hours:</b> 1000 -0/+48 hours
Resistance to Humidity (Unload Test)		<b>Temperature:</b> 85 ± 2°C <b>Relative Humidity:</b> 85% RH <b>Test Hours:</b> 1000 -0/+48 hours
Resistance to High Temperature		<b>Temperature:</b> 125 ± 2°C <b>Test Voltage:</b> Rated Voltage <b>Test Hours:</b> 1000 -0/+48 hours
Resistance to Low Heat		<b>Temperature:</b> -55 ± 2°C <b>Test Hours:</b> 1000 -0/+48 hours
Temperature Cycle		<b>Temperature:</b> -55°C 30 min 125°C 30 min <b>Hours for 1 Cycle:</b> 2 hours <b>Temperature Cycle:</b> 50 cycles or more
Vibration	<b>Visual Examination:</b> No mechanical damage <b>Capacitance:</b> Within ± 2.0% or ± 0.02 pF whichever is more <b>Q Value:</b> 100 or more <b>Insulation Resistance:</b> 10,000 MΩ or more	<b>Frequency of Vibration:</b> 10 to 100 Hz <b>Sweeping:</b> 10→100→10Hz 5 min 5.0 G This motion shall be applied for a period of 2 hrs in each of 3 mutually perpendicular axes
Shock		Half of sine wave (100 G) shall be applied for a period of 5 msec. in each of 3 mutually perpendicular axes

The specimen shall be subjected to standard atmospheric condition for 24 hours after which measurement shall be made.

## 10. Packaging

### (1) Dimensions of Carrier Tape



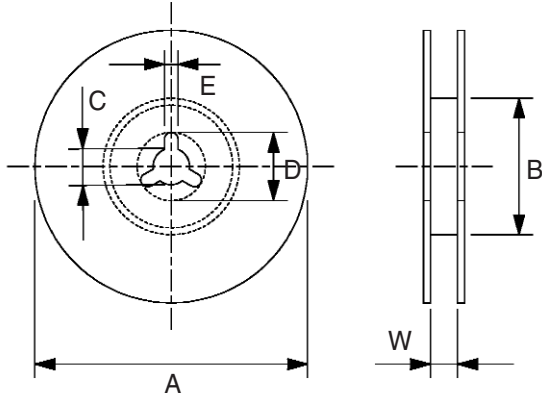
Dimensions in inches (mm)

	A	B	C	D	E
<b>HFC1005</b>	0.026 ± 0.001 (0.65 ± 0.03)	0.79 ± 0.002 (2.00 ± 0.05)	0.315 ± 0.004 (8.00 ± 0.10)	0.138 ± 0.002 (3.50 ± 0.05)	0.069 ± 0.004 (1.75 ± 0.10)
<b>HFC1410</b>	0.047 ± 0.002 (1.20 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.315 ± 0.008 (8.00 ± 0.20)	0.138 ± 0.002 (3.50 ± 0.05)	0.069 ± 0.004 (1.75 ± 0.10)
<b>HFC1608</b>	0.039 ± 0.002 (1.00 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.315 ± 0.008 (8.00 ± 0.20)	0.138 ± 0.002 (3.50 ± 0.05)	0.069 ± 0.004 (1.75 ± 0.10)
<b>HFC1610</b>	0.047 ± 0.002 (1.20 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.315 ± 0.008 (8.00 ± 0.20)	0.138 ± 0.002 (3.50 ± 0.05)	0.069 ± 0.004 (1.75 ± 0.10)
<b>HFC1612</b>	0.055 ± 0.002 (1.40 ± 0.05)	0.157 ± 0.004 (4.00 ± 0.10)	0.315 ± 0.008 (8.00 ± 0.20)	0.138 ± 0.002 (3.50 ± 0.05)	0.069 ± 0.004 (1.75 ± 0.10)

Dimensions in inches (mm)

	F	G	H	J	T	T'
<b>HFC1005</b>	0.157 ± 0.004 (4.00 ± 0.10)	0.045 ± 0.001 (1.15 ± 0.03)	0.059 +0.004/-0 (∅ 1.50 +0.1/-0)	N/A	0.026 ± 0.001 (0.65 ± 0.02)	0.024 ± 0.002 (0.60 ± 0.05)
<b>HFC1410</b>	0.157 ± 0.004 (4.00 ± 0.10)	0.063 ± 0.002 (1.60 ± 0.05)	0.061 ± 0.002 (∅ 1.55 ± 0.05)	0.079 ± 0.002 (2.00 ± 0.05)	0.012 ± 0.002 (0.30 ± 0.05)	0.047 ± 0.004 (1.20 ± 0.10)
<b>HFC1608</b>	0.157 ± 0.004 (4.00 ± 0.10)	0.071 ± 0.002 (1.80 ± 0.05)	0.061 ± 0.002 (∅ 1.55 ± 0.05)	0.079 ± 0.002 (2.00 ± 0.05)	0.012 ± 0.002 (0.30 ± 0.05)	0.030 or 0.037 ± 0.004 (0.75 or 0.95 ± 0.10)
<b>HFC1610</b>	0.157 ± 0.004 (4.00 ± 0.10)	0.071 ± 0.002 (1.80 ± 0.05)	0.061 ± 0.002 (∅ 1.55 ± 0.05)	0.079 ± 0.002 (2.00 ± 0.05)	0.012 ± 0.002 (0.30 ± 0.05)	0.031 or 0.039 or 0.047 ± 0.004 (0.80 or 1.00 or 1.20 ± 0.10)
<b>HFC1612</b>	0.157 ± 0.004 (4.00 ± 0.10)	0.071 ± 0.002 (1.80 ± 0.05)	0.061 ± 0.002 (∅ 1.55 ± 0.05)	0.079 ± 0.002 (2.00 ± 0.05)	0.012 ± 0.002 (0.30 ± 0.05)	0.055 ± 0.004 (1.40 ± 0.10)

(2) Reel specifications for taping



Dimensions in inches (mm)

	A	B	C	D	E	W
<b>HFC Series</b>	7.00 ± 0.78 (178 ± 2)	3.15 (80 min.)	0.511 ± 0.02 (13 ± 0.5)	0.83 ± 0.03 (21 ± 0.8)	0.079 ± 0.02 (2 ± 0.5)	0.394 ± 0.059 (10 ± 1.5)
<b>HFC1005 only</b>		2.36 (60 min.)				

(3) Standard Packing Quantity

Chip Size	Quantity
<b>1005</b>	10,000 pcs/reel
<b>1410</b>	3,000 pcs/reel
<b>1608</b>	4,000 pcs/reel
<b>1610</b>	3,000 pcs/reel
<b>1612</b>	3,000 pcs/reel



## 12. General Information

### (1) Storage

The products shall be stored at 10°C to 35°C at the humidity of 30% to 70%. The products shall not be stored where they are exposed to harmless gases. (Ex. Hydrogen chloride, Sulfurous acid gas or Hydrogen sulfide) Soldering shall be done 12 months since delivery. When the former requirements are not satisfied, the solderability test shall be done prior to soldering.

### (3) Soldering

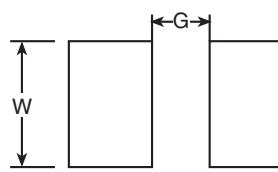
Ceramics are in general very sensitive to thermal shocks. Therefore the products shall not be exposed to a sudden temperature increase, decrease or partial heating. Preheat shall be done before using the soldering iron (ex. Hot wind etc.) Temperature difference between temperature of soldering iron tip and temperature of the products shall not exceed 130°C. The soldering iron shall not contact directly with the product, in order to avoid damage to the product. It is desirable that soldering temperature is 240°C to 250°C. Flux shall be colophony type. Strong acid type flux shall not be used. Wattage of the soldering iron shall be 20W or less at the temperature of 220°C to 250°C. The tip of soldering iron shall be 3ø or less. Application time of the soldering shall be 4 seconds or less.

### (4) Cleaning

Cleaning using isopropyl alcohol shall be done at a temperature of 60°C or less within 5 minutes. It has been checked that the products aren't damaged by ultrasonic cleaning at a cleaning agent temperature of 60°C or less, a frequency of 28kHz and a power of 20W within a minute.

### (6) Pattern design

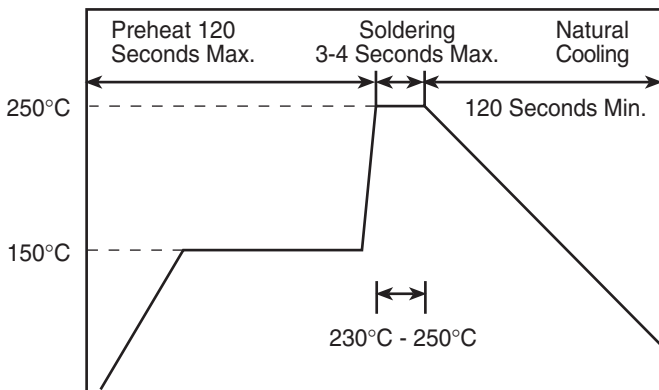
The land pattern is recommended as follows.



Dimensions - inches (mm)		
Part	L	W
<b>1005</b>	0.015 (0.40)	0.020 (0.50)
<b>1410</b>	0.031 (0.80)	0.039 (1.00)
<b>1608</b>	0.039 (1.00)	0.031 (0.80)
<b>1610</b>	0.039 (1.00)	0.039 (1.00)
<b>1612</b>	0.039 (1.00)	0.047 (1.20)

## 13. Recommended Soldering Conditions

**Recommended Condition for Flow Soldering**



**Recommended Condition for Reflow Soldering**

