

## ● Part Numbering

### CERALOCK® (MHz)

(Part Number)

|    |   |    |      |   |   |   |     |     |
|----|---|----|------|---|---|---|-----|-----|
| CS | T | CE | 16M0 | V | 5 | 3 | *** | -R0 |
| ①  | ② | ③  | ④    | ⑤ | ⑥ | ⑦ | ⑧   | ⑨   |

#### ① Product ID

| Product ID |                    |
|------------|--------------------|
| CS         | Ceramic Resonators |

#### ② Frequency/Capacitance

| Code | Frequency/Capacitance       |
|------|-----------------------------|
| A    | MHz No capacitance built-in |
| T    | MHz Built-in Capacitance    |

#### ③ Structure/Size

| Code     | Structure/Size             |
|----------|----------------------------|
| LS       | Round Lead Type            |
| CC       | Cap Chip Type              |
| CR/CE/CG | Small-cap Chip Type        |
| CV       | Monolithic Chip Type       |
| CW/CZ    | Small Monolithic Chip Type |

#### ④ Nominal Center Frequency

Expressed by four-digit alphanumerics. The unit is in hertz (Hz).  
 Decimal point is expressed by capital letter "M".

#### ⑤ Design

| Code  | Design                                 |
|-------|--|
| G□□   | Thickness Shear mode                   |
| T/V□□ | Thickness Expander mode                |
| X□□   | Thickness Expander mode (3rd overtone) |

□□ indicates initial frequency tolerance and load capacity.

#### ⑥ Initial Frequency Tolerance

| Code | Design       |
|------|--------------|
| 5    | ±0.5%        |
| 3    | ±0.3%        |
| 2    | ±0.2%        |
| 1    | ±0.1%        |
| H    | ±0.07%       |
| K    | -0.025/0.02% |

#### ⑦ Load Capacity

| Code | Design     |
|------|------------|
| 1    | 3/5/6pF    |
| 2    | 10pF       |
| 3    | 15pF       |
| 4    | 22pF       |
| 5    | 30/33/39pF |
| 6    | 47pF       |

#### ⑧ Individual Specification

| Code | Individual Specification                                      |
|------|---|
| ***  | Three-digit alphanumerics express "Individual Specification". |

With standard products, "⑧ Individual Specification" is omitted, and "⑨ Packaging" is carried up.

#### ⑨ Packaging

| Code | Packaging                          |
|------|------------------------------------|
| -B0  | Bulk                               |
| -A0  | Radial Taping H <sub>0</sub> =18mm |
| -R0  | Plastic Taping ø=180mm             |
| -R1  | Plastic Taping ø=330mm             |

Radial taping is applied to lead type and plastic taping to chip type.

# Ceramic Resonators (CERALOCK®)



1

## MHz Chip Type -Tight Frequency Tolerance for Automotive-

Chip type CERALOCK(R) with built-in load capacitors in an extremely small package provides high accuracy. MURATA's frequency adjustment and package technology expertise has enabled the development of the chip CERALOCK(R) with built-in load capacitors. Chip CERALOCK(R) for automotive has achieved importance in the worldwide automotive market. This diverse series owes its development to MURATA's original mass production techniques and high reliability.

### ■ Features

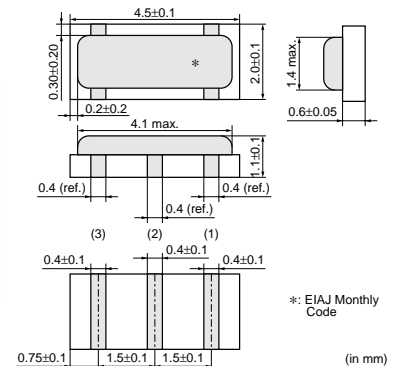
1. The series are high accuracy resonators whose total tolerance is available for less than  $\pm 3,000\text{ppm}$ .
2. The series has high reliability and is available for wide temperature range.
3. Oscillation circuits do not require external load capacitors.
4. The series is available for a wide temperature range.
5. The resonators are extremely small and have a low profile.
6. No adjustment is necessary for oscillation circuits.

### ■ Applications

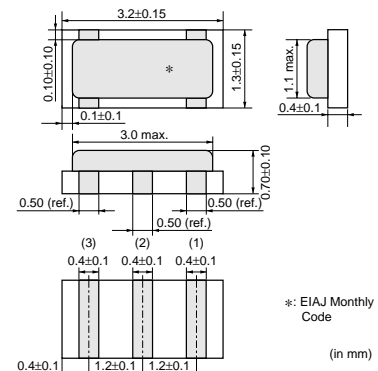
1. Cluster panel and Control panel
2. Safety control  
(Anti-lock Brake System, Electronic Stability Control, Airbag, etc.)
3. Engine ECU, Electronic Power Steering, Immobilizer, etc.
4. Car Air-conditioner, Power window, Remote Keyless Entry system, etc.
5. Intelligent Transportation System  
(Lane Keeping System, Millimeter wave radar, etc.)
6. Battery control for hybrid car



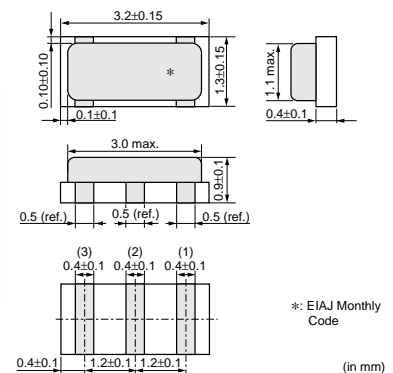
CSTCR\_G15C  
4.00-7.99MHz



CSTCE\_G15C  
8.00-13.99MHz



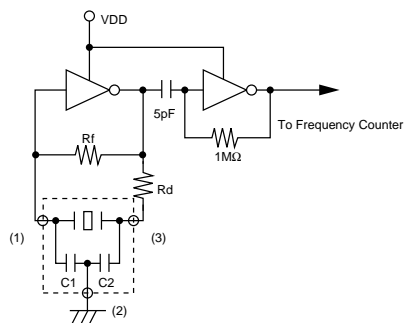
CSTCE\_V13C  
14.00-20.00MHz



| Part Number | Oscillating Frequency (MHz) | Initial Tolerance | Temp. Stability (%) | Temperature Range (°C) |
|-------------|-----------------------------|-------------------|---------------------|------------------------|
| CSTCR_G15C  | 4.00 to 7.99                | $\pm 0.1\%$       | $\pm 0.13$          | -40 to 125             |
| CSTCE_G15C  | 8.00 to 13.99               | $\pm 0.1\%$       | $\pm 0.13$          | -40 to 125             |
| CSTCE_V13C  | 14.00 to 20.00              | $\pm 0.1\%$       | $\pm 0.13$          | -40 to 125             |

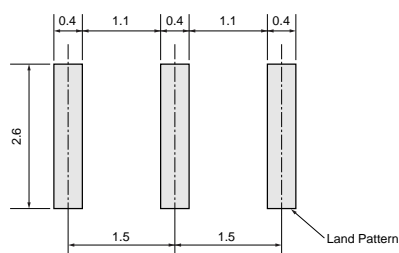
Irregular or stop oscillation may occur under unmatched circuit conditions. Please check the actual conditions prior to use.

## ■ Oscillation Frequency Measuring Circuit



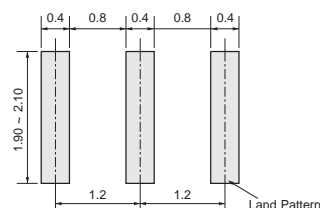
## ■ Standard Land Pattern Dimensions

CSTCR\_G15C  
(\* This Land Pattern is not common to CSTCR\_G.)



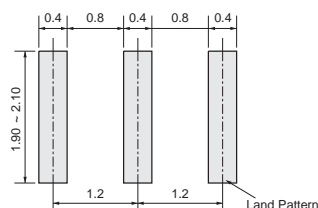
(in mm)

CSTCE\_G15C



(in mm)

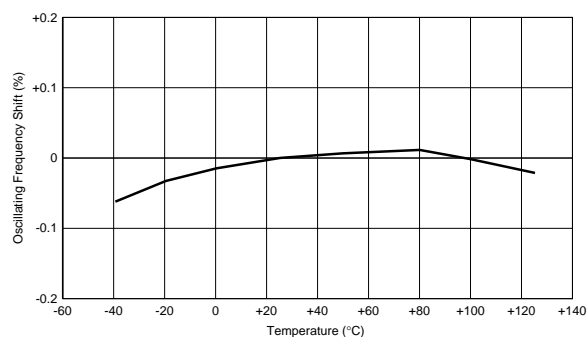
CSTCE\_V13C  
(\* This Land Pattern is not common to CSTCE\_V.)



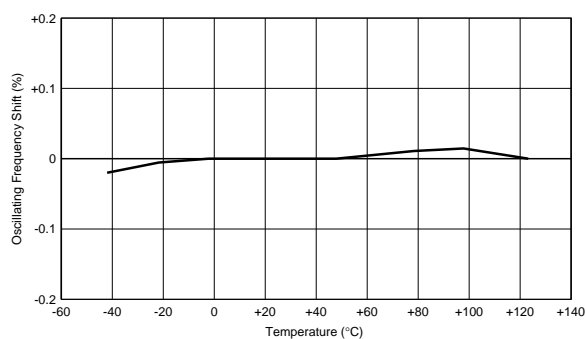
(in mm)

## ■ Oscillation Frequency Temperature Stability

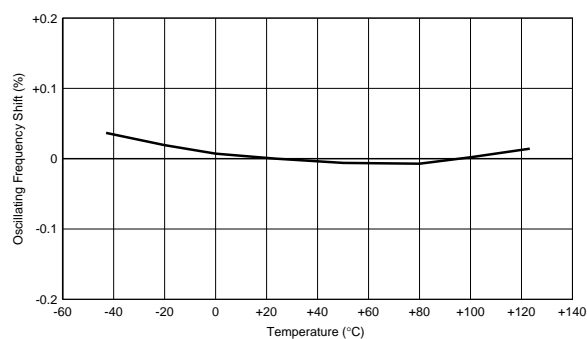
CSTCR\_G15C



CSTCE\_G15C



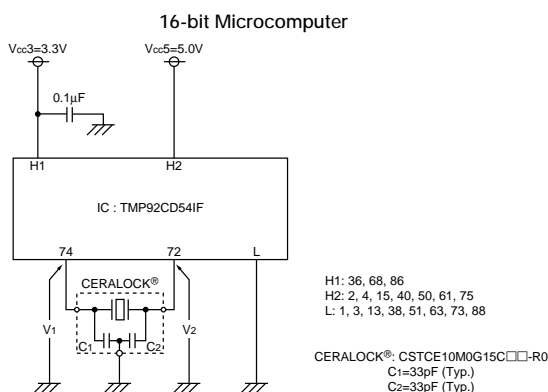
CSTCE\_V13C



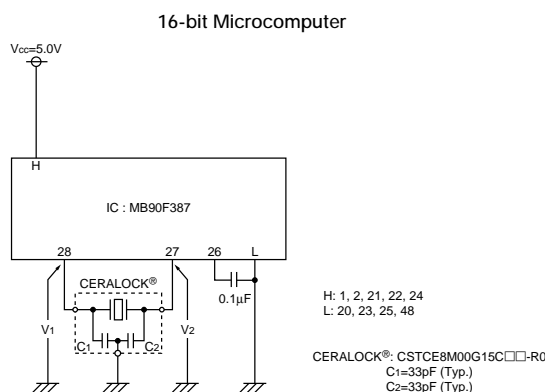
## Application Circuits Utilization

1

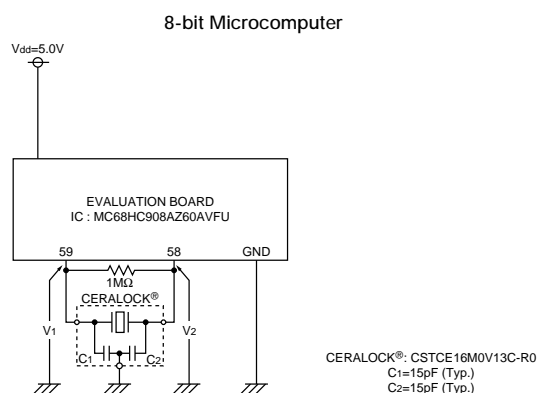
### ■ TMP92CD54IF (Toshiba)



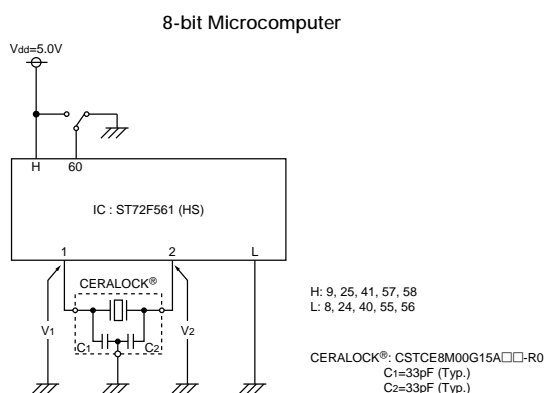
### ■ MB90F387 (Fujitsu)



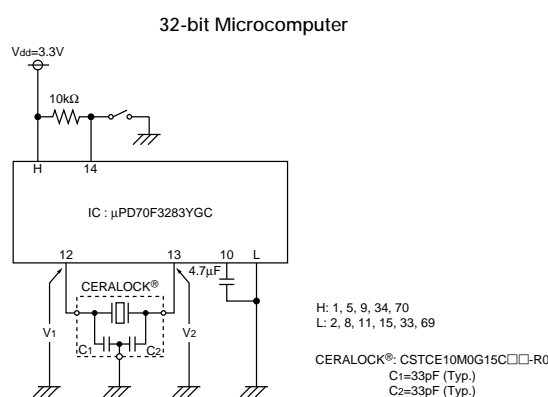
### ■ MC68HC908AZ60AVFU (Freescale)



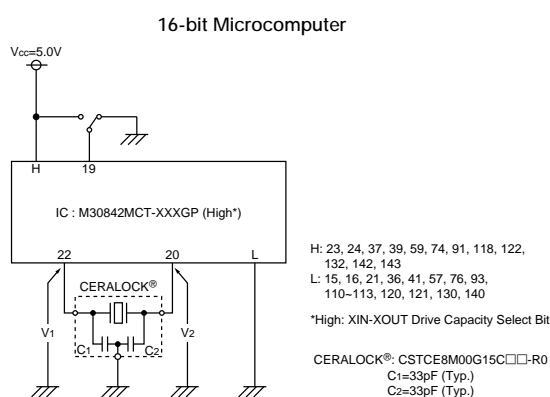
### ■ ST72F561 (HS) (ST Microelectronics)



### ■ uPD70F3283YGC (NEC Electronics)



### ■ M30842MCT-XXXGP (Renesas)



# Ceramic Resonators (CERALOCK®)

**MURATA**

## MHz Chip Type -Standard Frequency Tolerance for Automotive-

2

Chip type CERALOCK(R) with built-in load capacitors in an extremely small package provides high accuracy. MURATA's frequency adjustment and package technology expertise has enabled the development of the chip CERALOCK(R) with built-in load capacitors. Chip CERALOCK(R) for automotive has achieved importance in the worldwide automotive market. This diverse series owes its development to MURATA's original mass production techniques and high reliability.

### ■ Features

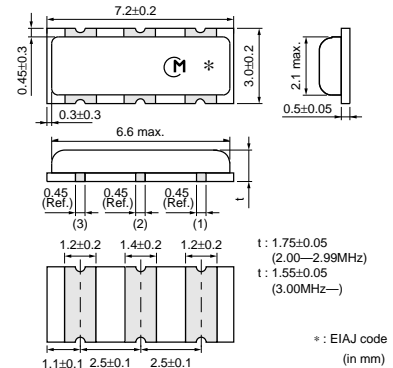
1. The series has high reliability and is available for wide temperature range.
2. Oscillation circuits do not require external load capacitors.
3. The series is available in a wide frequency range.
4. The resonators are extremely small and have a low profile.
5. No adjustment is necessary for oscillation circuits.

### ■ Applications

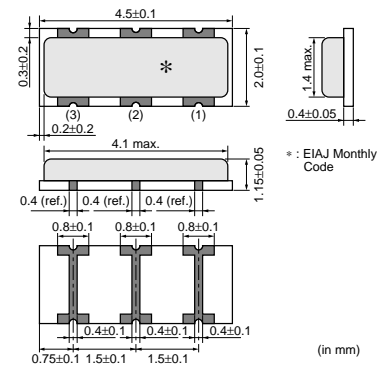
1. Cluster panel and Control panel
2. Safety control  
(Anti-lock Brake System, Electronic Stability Control, Airbag, etc.)
3. Engine ECU, Electronic Power Steering, Immobilizer, etc.
4. Car Air-conditioner, Power Window, Remote Keyless Entry system, etc.
5. Electronic Toll Collection system, Car Navigation, etc.



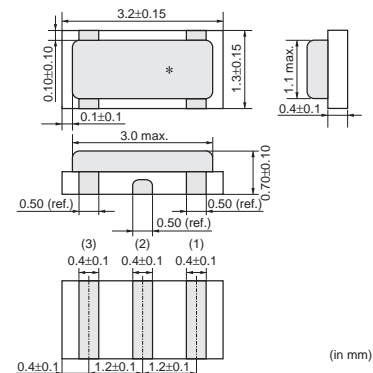
CSTCC\_G\_A  
2.00-3.99MHz



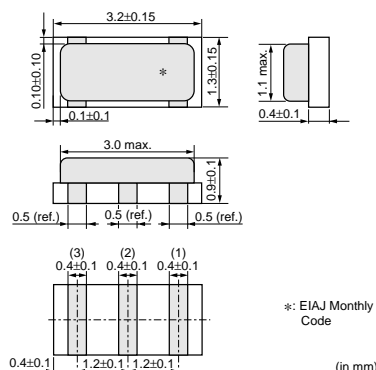
CSTCR\_G\_B  
4.00-7.99MHz



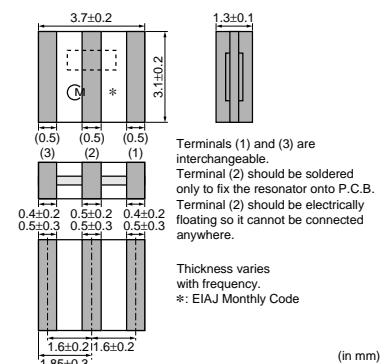
CSTCE\_G\_A  
8.00-13.99MHz



CSTCE\_V\_C  
14.00-20.00MHz



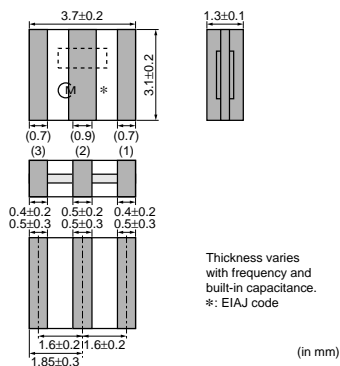
CSACV\_X\_Q  
20.01-70.00MHz



Continued on the following page. ↗

Continued from the preceding page.

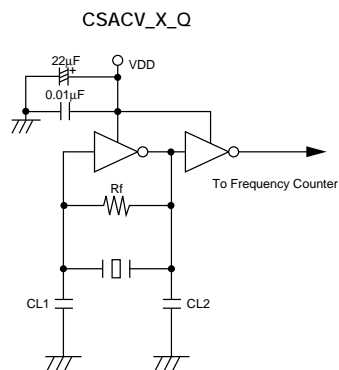
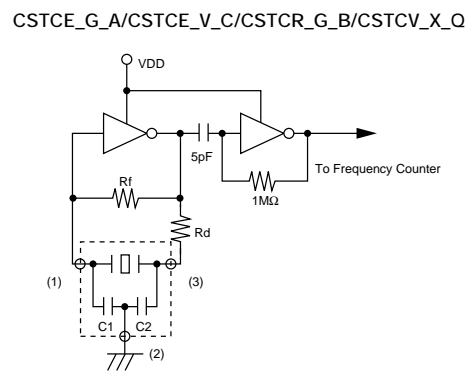
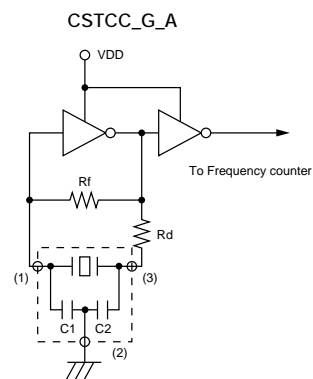
CSTCV\_X\_Q  
20.01-70.00MHz



| Part Number | Oscillating Frequency (MHz) | Initial Tolerance | Temp. Stability (%)   | Temperature Range (°C) |
|-------------|-----------------------------|-------------------|---|------------------------|
| CSTCC_G_A   | 2.00 to 3.99                | ±0.5%             | ±0.4<br>[-0.6% to +0.3%:Built-in Capacitance 47pF type within Freq.2.00 to 3.49MHz] | -40 to 125             |
| CSTCR_G_B   | 4.00 to 7.99                | ±0.5%             | ±0.15   | -40 to 125             |
| CSTCE_G_A   | 8.00 to 13.99               | ±0.5%             | ±0.2  | -40 to 125             |
| CSTCE_V_C   | 14.00 to 20.00              | ±0.5%             | ±0.15   | -40 to 125             |
| CSACV_X_Q   | 20.01 to 70.00              | ±0.5%             | ±0.3  | -40 to 125             |
| CSTCV_X_Q   | 20.01 to 70.00              | ±0.5%             | ±0.3  | -40 to 125             |

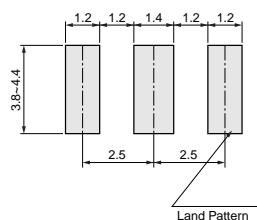
Irregular or stop oscillation may occur under unmatched circuit conditions. Please check the actual conditions prior to use.

## ■ Oscillation Frequency Measuring Circuit



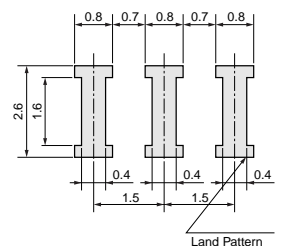
## ■ Standard Land Pattern Dimensions

CSTCC\_G\_A



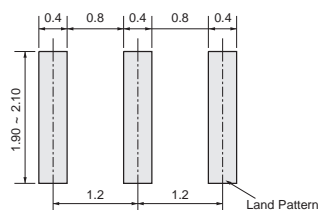
(in mm)

CSTCR\_G\_B



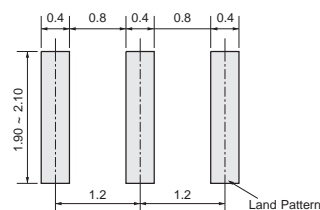
(in mm)

CSTCE\_G\_A



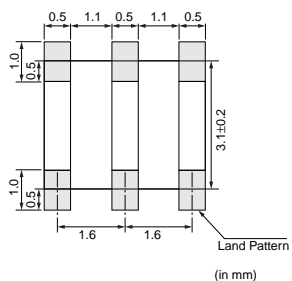
(in mm)

CSTCE\_V\_C  
(\* This Land Pattern is not common to CSTCE\_V.)



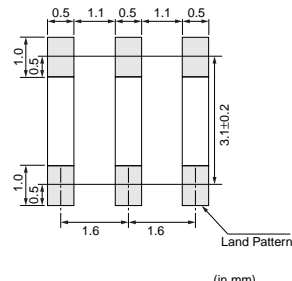
(in mm)

CSTCV\_X\_Q



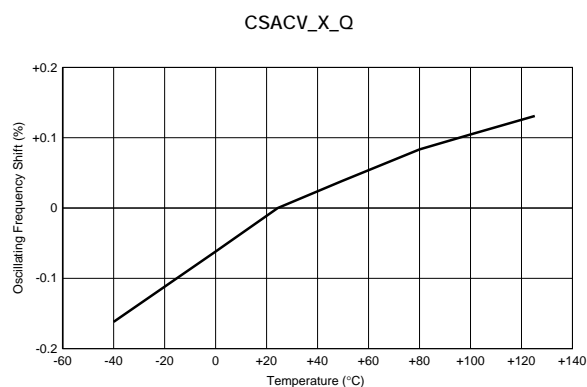
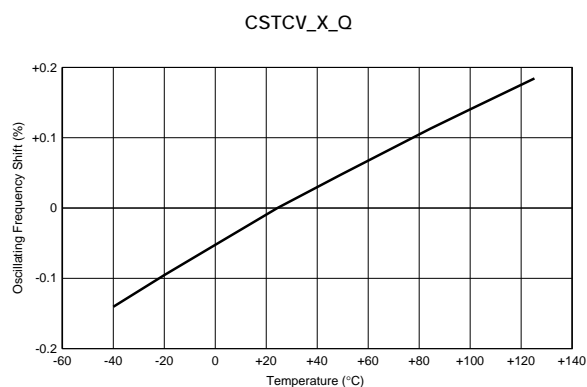
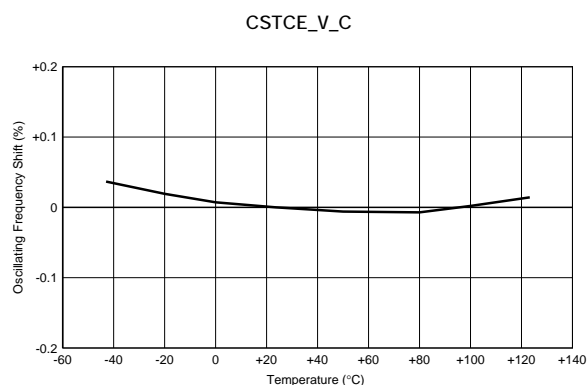
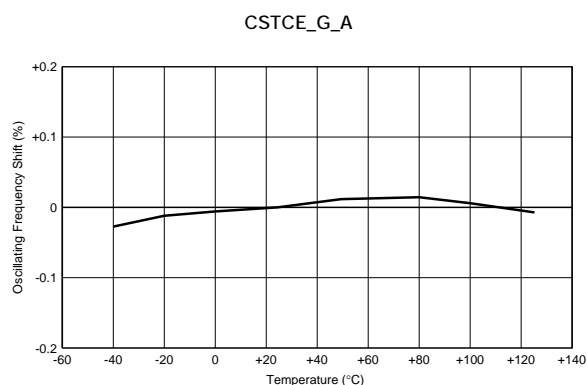
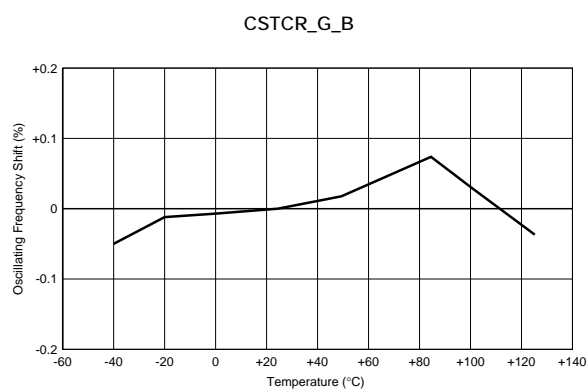
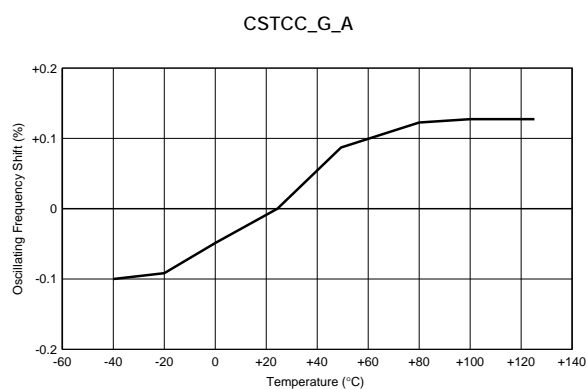
(in mm)

CSACV\_X\_Q



(in mm)

## ■ Oscillation Frequency Temperature Stability

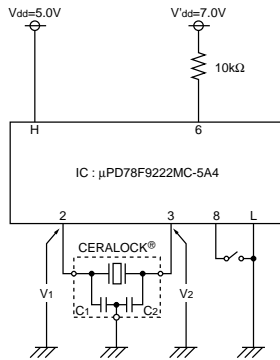


## Application Circuits Utilization

2

### ■ uPD78F9222MC-5A4 (NEC Electronics)

8-bit Microcomputer

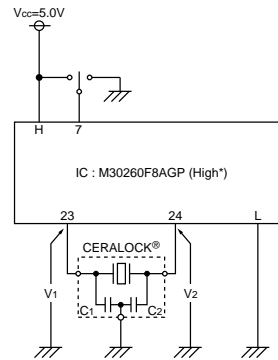


H: 5, 20  
L: 1

CERALOCK®: CSTCR6M00G55B-R0  
C1=39pF (Typ.)  
C2=39pF (Typ.)

### ■ M30260F8AGP (Renesas)

16-bit Microcomputer



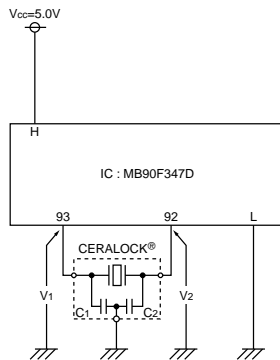
H: 11, 46, 47, 48  
L: 4, 9, 44

\*High: XIN-XOUT Drive Capacity Select Bit

CERALOCK®: CSTCE10M0G55A-R0  
C1=33pF (Typ.)  
C2=33pF (Typ.)

### ■ MB90F347D (Fujitsu)

16-bit Microcomputer

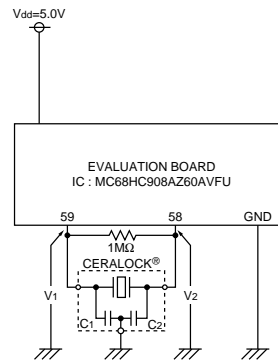


H: 15, 32, 65, 90  
L: 16, 35, 44, 66, 91

CERALOCK®: CSTCE8M00G55A-R0  
C1=33pF (Typ.)  
C2=33pF (Typ.)

### ■ MC68HC908AZ60AVFU (Freescale)

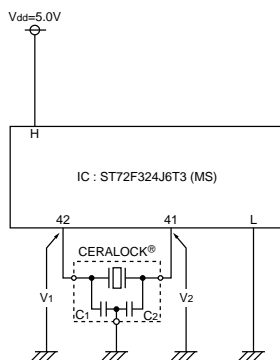
8-bit Microcomputer



CERALOCK®: CSTCE16M0V53C-R0  
C1=15pF (Typ.)  
C2=15pF (Typ.)

### ■ ST72F324J6T3 (MS) (ST Microelectronics)

8-bit Microcomputer

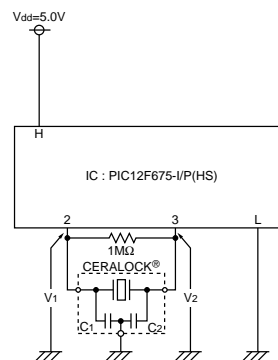


H: 13, 21, 32, 43  
L: 14, 22, 33, 39, 40

CERALOCK®: CSTCR4M00G55B-R0  
C1=39pF (Typ.)  
C2=39pF (Typ.)

### ■ PIC12F675-I/P (HS) (Microchip)

8-bit Microcomputer



H: 1  
L: 4, 8

CERALOCK®: CSTCE8M00G52A-R0  
C1=10pF (Typ.)  
C2=10pF (Typ.)

## MHz Chip Type Notice (Soldering and Mounting) for Automotive

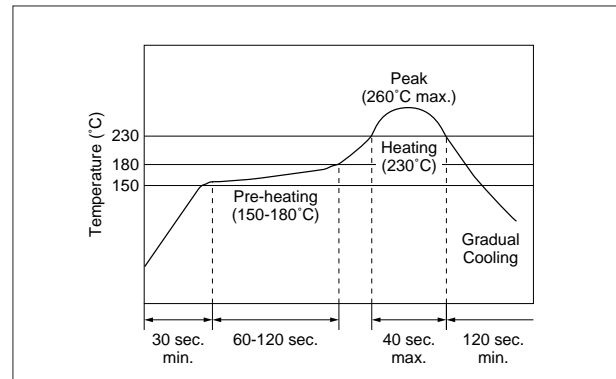
### ■ CSTCC/CSTCR/CSTCE\_V/CSTCE\_G/CSTCV/CSACV Series

#### 1. Soldering Conditions

##### (1) Reflow

One heat stress, shown in the profile at right, is applied to resonator, then after being placed in natural conditions for 1 hour, the resonator is measured.

- (a) Pre-heating conditions should be +150 to +180°C for 60 to 120 seconds. Ascending time up to +150°C should be longer than 30 seconds.
- (b) Heating conditions should be within 40 seconds at +230°C min., but peak temperature should be lower than +260°C.



##### (2) Soldering Iron

Components shall be measured after soldering on PCB at +350±5°C for 3.0±0.5 seconds and leaving in natural condition for 24 hours. The soldering iron shall not touch the components while soldering.

#### 2. Wash

##### (1) Cleaning Solvents

HCFC, Isopropanol, Tap water, Demineralized water, Cleanthrough750H, Pine alpha 100S, Techno care FRW

##### (2) Temperature Difference : dT \*1

dT≤60°C (dT=Component-solvent)

\*1 ex. In case the component at +90°C immerses into cleaning solvent at +60°C, then dT=30°C.

##### (3) Conditions

###### (a) Ultrasonic Wash

1 minute max. in above solvent at +60°C max.  
(Frequency: 28kHz, Output: 20W/l)

###### (b) Immersion Wash

5 minutes max. in above solvent at +60°C max.

###### (c) Shower or Rinse Wash

5 minutes max. in above solvent at +60°C max.

##### (4) Drying

5 minutes max. by air blow at +80°C max.

##### (5) Others

- (a) Total washing time should be within 10 minutes.
- (b) The component may be damaged if it is washed with chlorine, petroleum, or alkali cleaning solvent.

#### 3. Notice for Mounting

- (a) The component is recommended for use with placement machines which employ optical placement capabilities. The component might be damaged by excessive mechanical force. Please make sure to evaluate by using placement machines before going into mass production. Do not use placement machines which utilize mechanical positioning. Please contact Murata for details beforehand.

- (b) Please insure the component is thoroughly evaluated in your application circuit.
- (c) Please do not apply excess mechanical stress to the component and terminals during soldering.

## MHz Chip Type Notice for Automotive

### ■ Notice (Storage and Operating Conditions)

#### 1. Product Storage Condition

Please store the products in room where the temperature/humidity is stable. And avoid such places where there are large temperature changes. Please store the products under the following conditions:

Temperature: -10 to + 40 degrees C

Humidity: 15 to 85% R.H.

#### 2. Expire Date on Storage

Expire date (Shelf life) of the products is six months after delivery under the conditions of a sealed and an unopened package. Please use the products within six months after delivery. If you store the products for a long time (more than six months), use carefully because the products may be degraded in the solderability and/or rusty. Please confirm solderability and characteristics for the products regularly.

#### 3. Notice on Product Storage

- (1) Please do not store the products in a chemical atmosphere (Acids, Alkali, Bases, Organic gas, Sulfides and so on), because the characteristics may be reduced in quality, and/or be degraded in the solderability due to the storage in a chemical atmosphere.

- (2) Please do not put the products directly on the floor without anything under them to avoid damp places and/or dusty places.

- (3) Please do not store the products in the places such as: in a damp heated place, in a place where direct sunlight comes in, in place applying vibrations.

- (4) Please use the products immediately after the package is opened, because the characteristics may be reduced in quality, and/or be degraded in the solderability due to storage under the poor condition.

- (5) Please do not drop the products to avoid cracking of ceramic element.

#### 4. Others

Conformal coating of the component is acceptable. However, the resin material, curing temperature, and other process conditions should be evaluated to confirm that stable electrical characteristics are maintained.

Please be sure to consult with our sales representative or engineer whenever and prior to using the products.

### ■ Notice (Rating)

The component may be damaged if excess mechanical stress is applied.

### ■ Notice (Handling)

"CERALOCK" may stop oscillating or oscillate irregularly under improper circuit conditions.

## MHz Chip Type Packaging for Automotive

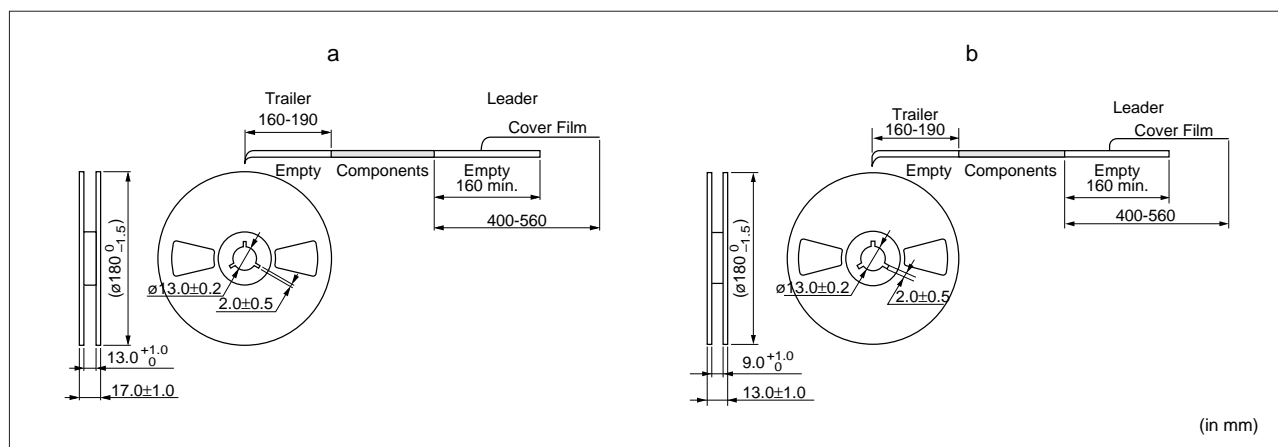
### ■ Minimum Quantity

| Part Number | Plastic Tape ø180mm | Plastic Tape ø330mm | Bulk | Dimensions |
|-------------|---------------------|---------------------|------|------------|
| CSTCC_G_A   | 2,000               | 6,000               | 500  | a          |
| CSTCR_G_B   | 3,000               | 9,000               | 500  | a          |
| CSTCR_G15C  | 3,000               | 9,000               | 500  | a          |
| CSTCE_G_A   | 3,000               | 9,000               | 500  | b          |
| CSTCE_G15C  | 3,000               | 9,000               | 500  | b          |
| CSTCE_V_C   | 3,000               | 9,000               | 500  | b          |
| CSTCE_V13C  | 3,000               | 9,000               | 500  | b          |
| CSTCV_X_Q   | 2,000               | 6,000               | 500  | a          |
| CSACV_X_Q   | 2,000               | 6,000               | 500  | a          |

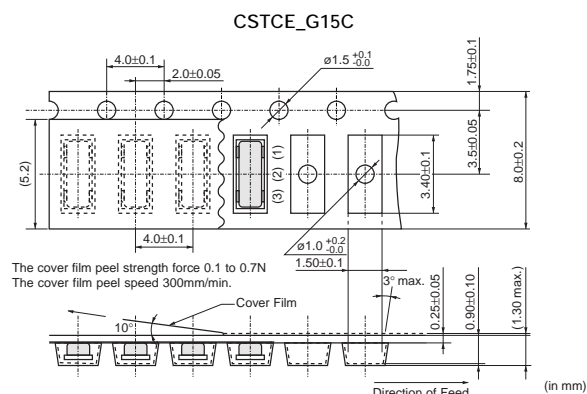
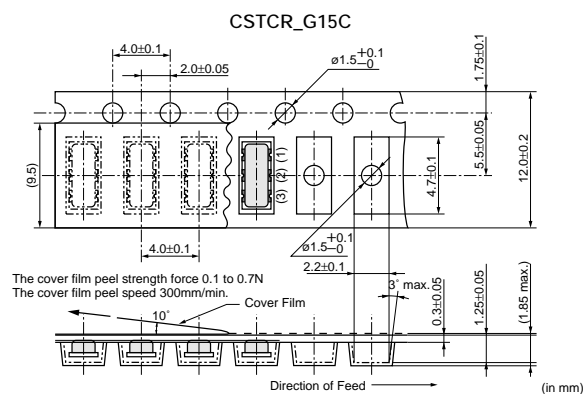
The order quantity should be an integral multiple of the "Minimum Quantity" shown above.

(pcs.)

### ■ Dimensions of Reel



### ■ Dimensions of Taping

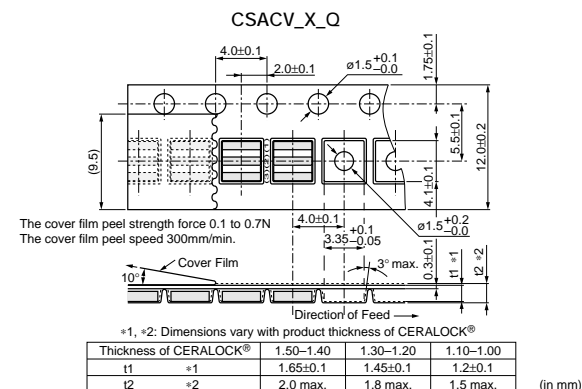
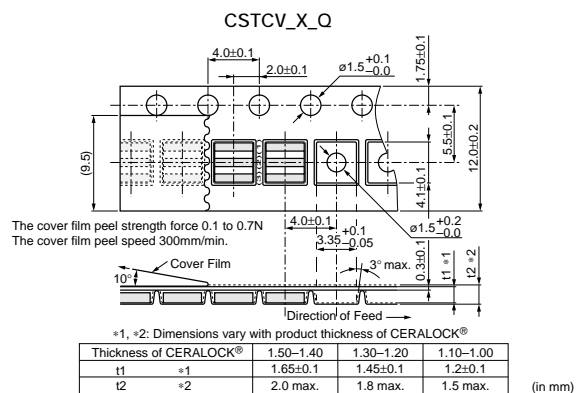
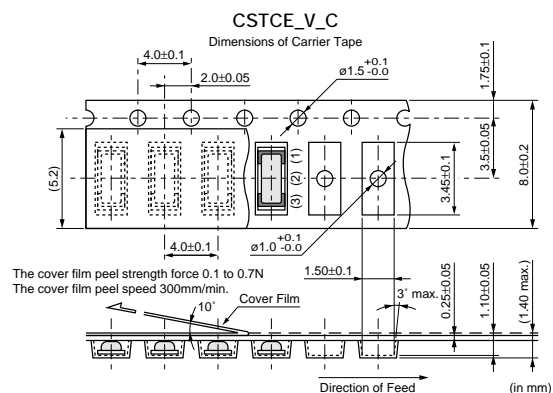
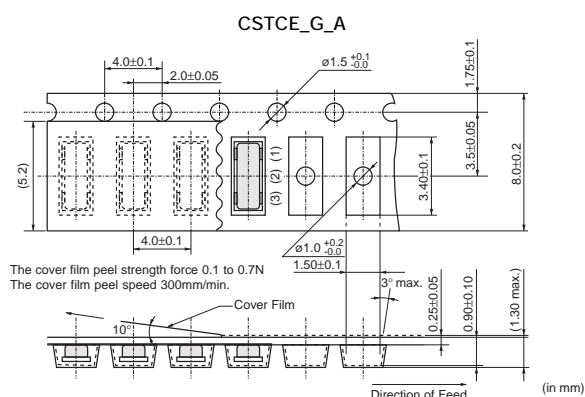
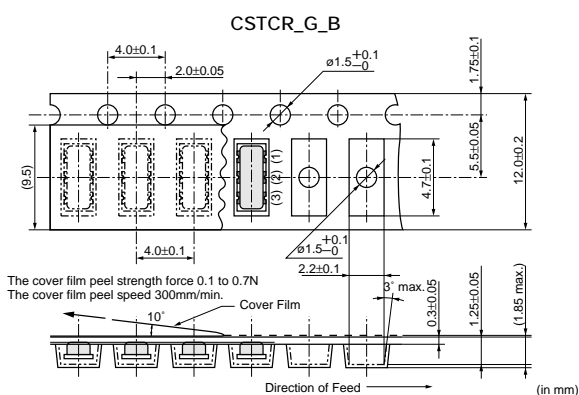
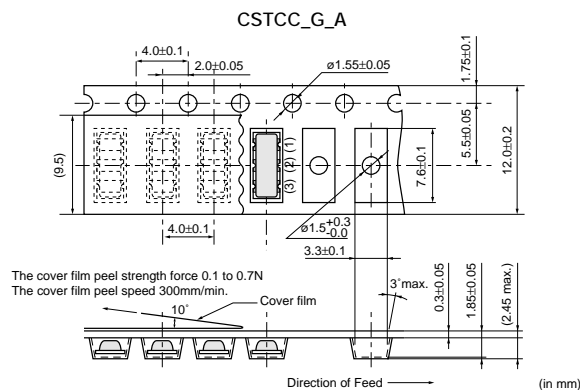
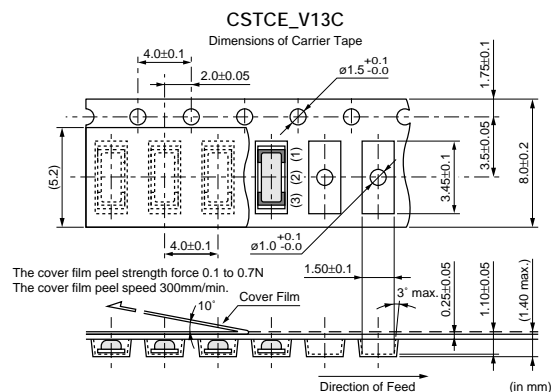


Continued on the following page.

## MHz Chip Type Packaging for Automotive

Continued from the preceding page.

### ■ Dimensions of Taping



\*1, \*2: Dimensions vary with product thickness of CERALOCK®

| Thickness of CERALOCK® | 1.50-1.40 | 1.30-1.20 | 1.10-1.00 |
|------------------------|-----------|-----------|-----------|
| t1                     | *1        | 1.65±0.1  | 1.45±0.1  |
| t2                     | *2        | 2.0 max.  | 1.8 max.  |

(in mm)

**⚠Note:**

1. Export Control

<For customers outside Japan>

No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

<For customers in Japan>

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

- |                             |  |
|-----------------------------|--|
| ① Aircraft equipment        | ② Aerospace equipment  |
| ③ Undersea equipment        | ④ Power plant equipment  |
| ⑤ Medical equipment         | ⑥ Transportation equipment (vehicles, trains, ships, etc.)   |
| ⑦ Traffic signal equipment  | ⑧ Disaster prevention / crime prevention equipment   |
| ⑨ Data-processing equipment | ⑩ Application of similar complexity and/or reliability requirements to the applications listed above |

3. Product specifications in this catalog are as of March 2009. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. Please read rating and ⚠ CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.

5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

6. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.

7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.



**Murata Manufacturing Co., Ltd.**

<http://www.murata.com/>

**Head Office**

1-10-1, Higashi Kotari, Nagaokakyo-shi, Kyoto 617-8555, Japan  
Phone: 81-75-951-9111

**International Division**

3-29-12, Shibuya, Shibuya-ku, Tokyo 150-0002, Japan  
Phone: 81-3-5469-6123 Fax: 81-3-5469-6155 E-mail: [intl@murata.co.jp](mailto:intl@murata.co.jp)