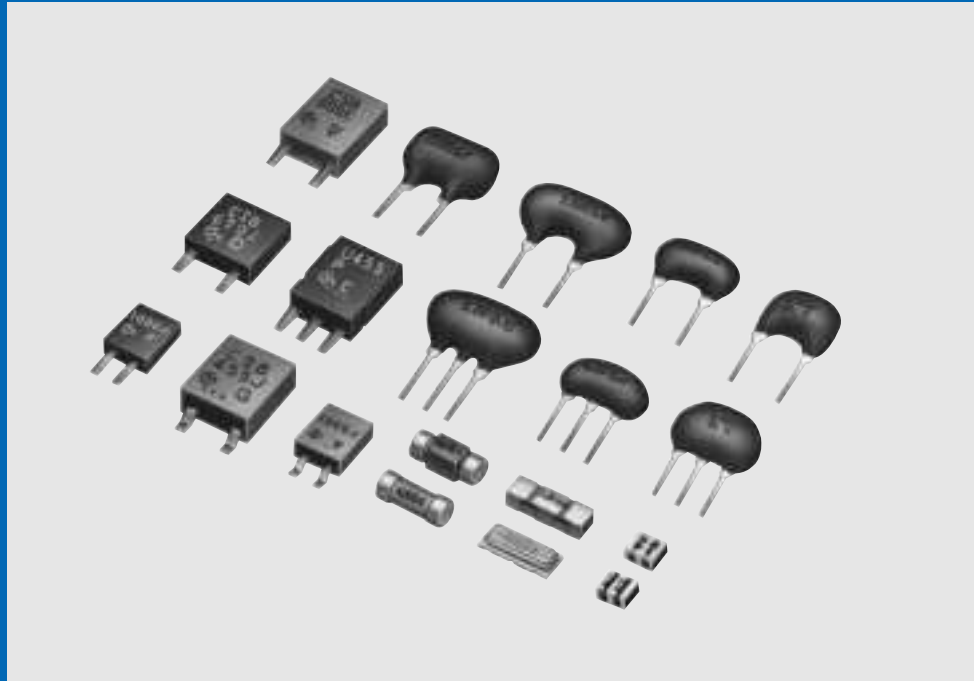




# CERAMIC RESONATOR (CERALOCK®)

## CERAMIC RESONATOR (CERALOCK®)



*Innovator  
in Electronics*

Murata  
Manufacturing Co., Ltd.

Cat.No.P16E-10

■CONTENTS

| Types               | Series             | With Built-in Capacitors | Frequency Range | Page  |
|---------------------|--------------------|--------------------------|-----------------|-------|
| Chip 3 Terminals    | CSTC□MG            | ○                        | 2M—3.49MHz      | 1—3   |
|                     | CSTCC□MG           | ○                        | 3.50M—10.00MHz  | 1—3   |
|                     | CSTCV□MTJ/MXJ      | ○                        | 10.01M—60MHz    | 1—3   |
| Chip 2 Terminals    | CSAC□MGC/MGCM      | —                        | 1.8M—6MHz       | 4—6   |
|                     | CSACV□MTJ/MXJ      | —                        | 8.00M—60MHz     | 4—6   |
| SMD, kHz range      | CSBF□J             | —                        | 430k—519kHz     | 7—9   |
|                     |                    |                          | 700k—1250kHz    | 7—9   |
| 2 Terminals, leaded | CSB□P/E/J/JR       | —                        | 375k—1250kHz    | 10—12 |
|                     | CSA□MK/MG/MTZ/MXZ  | —                        | 1.26M—60MHz     | 10—12 |
| 3 Terminals, leaded | CSU□P              | ○                        | 450k—500kHz     | 13—14 |
|                     | CST□MG/MGW/MTW/MXW | ○                        | 1.8M—60MHz      | 13—14 |

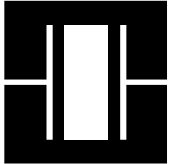
Application Circuits ..... 15—17

\*Available in several standard frequencies.

\*CSACS□MTA/MXA Series, CSTCS□MTA/MXA Series shall be applied for automotive use.

■NOTICE

- Unstable oscillation or oscillation stoppage might happen when CERALOCK® is used in improper way in conjunction with ICs. We are happy to evaluate the application circuit to avoid this for you.
- Oscillation frequency of our standard CERALOCK® is adjusted with our standard measuring circuit. There could be slight shift is frequency if other types of IC are used. When you require exact oscillation frequency in your application, we can adjust it with your specified circuit.
- Please consult with us regarding ultrasonic cleaning conditions to avoid possible damage during ultrasonic cleaning.



# CERAMIC RESONATOR



Chip Ceramic Resonator **CSTC/CSTCC/CSTCV** Series

## Chip CERALOCK® with built-in load capacitance in an extremely small package.

MURATA's package technology expertise has enabled the development of the Chip CERALOCK® with built-in load capacitance.

High-density mounting can be realized because of the small package and the elimination of the need for an external load capacitor.

### ■FEATURES

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



### ■APPLICATIONS

1. Clock oscillators for microprocessors.
2. Electronic control circuits for small electronic equipment such as hand held movie.
3. Audio-visual applications (Camcorder, Remote Controller, etc.)
4. Office automation equipments (DVD, CD-ROM, HDD, FDD, etc.)
5. Automotive electronics.(CSTC/CSTCC series)
6. Dual Tone Multi Frequency (DTMF) generator for cordless telephones.

### ■SPECIFICATIONS

| Item \ Type                                   | CSTC Series  | CSTCC Series    | CSTCV Series   |                |
|---|--------------|-----------------|----------------|----------------|
|   | CSTC□MG      | CSTCC□MG        | CSTCV□MTJ*6    | CSTCV□MXJ040*6 |
| Frequency Range                               | 2.00–3.49MHz | 3.50–10.00MHz*1 | 10.01–13.00MHz | 13.50–60.00MHz |
| Oscillation Frequency Initial Tolerance       | ±0.5%        | ±0.5%           | ±0.5%          | ±0.5%          |
| Oscillation Frequency Temperature Stability*2 | ±0.3%        | ±0.3%           | ±0.4%          | ±0.3%          |
| Aging*3                                       | ±0.3%        | ±0.3%           | ±0.3%          | ±0.3%          |

Oscillation Frequency Measuring Circuit

IC :1/6CD4069UBEX2\*4  
 V<sub>DD</sub> :5V (MTJ series:12V)  
 X :Chip CERALOCK®

\*1 Available in several standard frequencies. (ex. 3.58, 3.64, 3.68, 3.84, 4.00, 4.19, 4.91, 5.00, 6.00, 8.00, 10.00MHz)

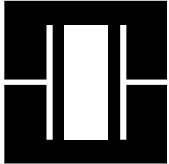
\*2 At -20 to +80°C

\*3 For 10 years at room temperature

\*4 TC74HCU04 is used as the standard circuit for the MXJ040 series.

\*5 If connected with incorrect orientation, the above specification may not be guaranteed.

\*6 CSTCS series shall be recommended in automotive application.



# CERAMIC RESONATOR



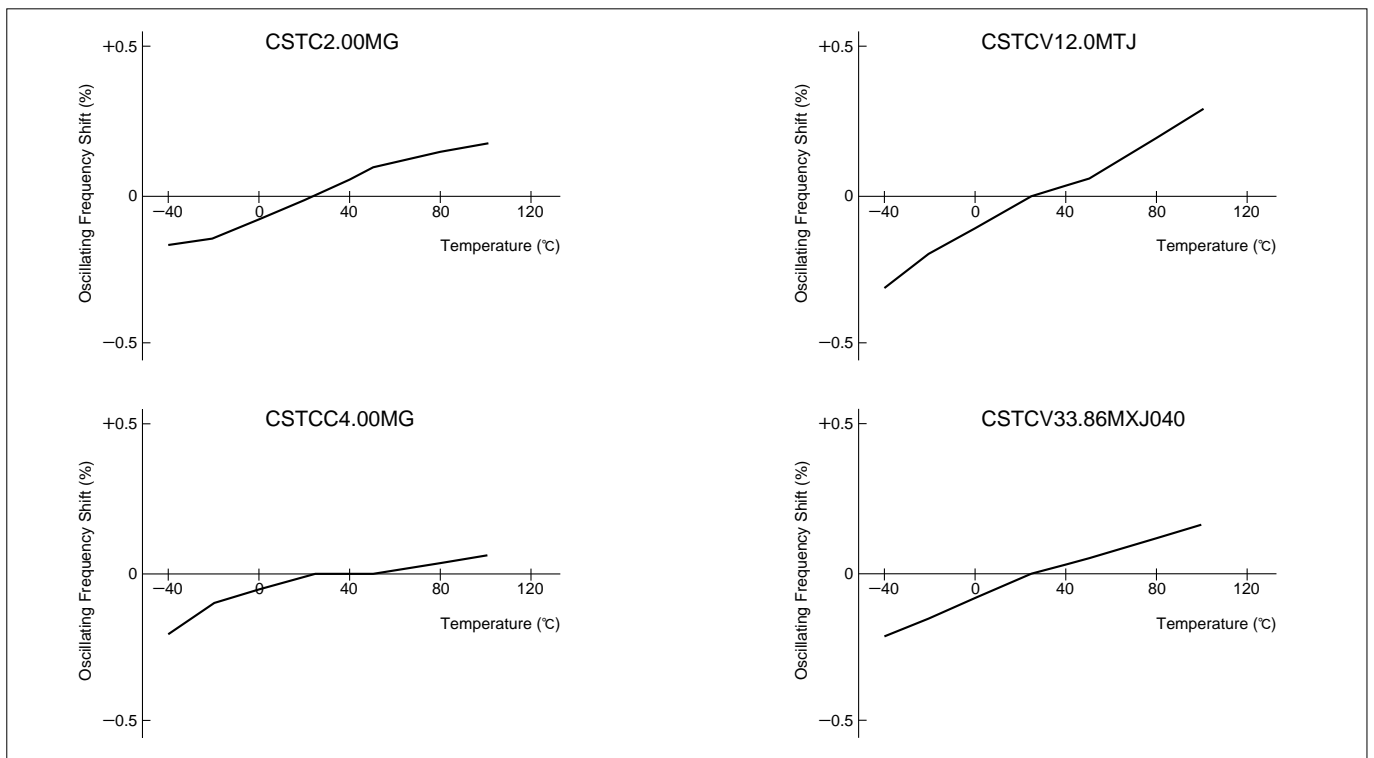
## Chip Ceramic Resonator **CSTC/CSTCC/CSTCV** Series

### ■ DIMENSIONS/STANDARD LAND PATTERN (in mm tol.:±0.3mm)

| Frequency             | 2.00—3.49MHz  | 3.50—10.00MHz  | 10.01—13.00MHz  | 13.50—60MHz  |
|-----------------------|---|--|---|--|
| Type                  | CSTC□MG   | CSTCC□MG   | CSTCV□MTJ   | CSTCV□MXJ040   |
| Dimensions            | <p>8.0±0.2, 2.00, 2.0max, 2.5±0.2, 2.0, 1.5±0.5, 4.75±0.5, 4.70±0.5, 2.2±0.5, 1.4±0.3, 2.2±0.5, (3), (2), (1)</p> | <p>7.2±0.2, 400, 0.45±0.3, 0.3±0.3, 0.5±0.05, 6.6max, 1.55±0.05, 1.2±0.2, 1.4±0.2, 1.2±0.2, 2.5±0.1, 1.1±0.1, 2.5±0.1, (0.45), (0.45), (0.45), (3), (2), (1)</p> | <p>3.7±0.2, 16.00, 1.2±0.2, 3.1±0.2, 0.7, 0.9, 0.7, (0.7), (0.9), (0.7), (3), (2), (1), 0.6±0.3, 0.7±0.3, 0.6±0.3</p> | <p>0.7±0.3, 0.9±0.3, 0.7±0.3, 1.5±0.2, 1.5±0.2, 1.85±0.3</p> |
| Standard Land Pattern | <p>1.6, 1.4, 1.6, 1.4, 1.6, 3.5-4.5, 2.6, 2.6</p>   | <p>1.2, 1.2, 1.4, 1.2, 1.2, 3.8-4.4, Land Pattern, electrode</p>   | <p>0.7, 0.7, 0.9, 0.7, 0.7, 1.0, 0.5, 1.0, 0.5, 1.5, 1.5, 3.1±0.2</p>   |  |

\*Thickness varies with frequencies.

### ■ THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



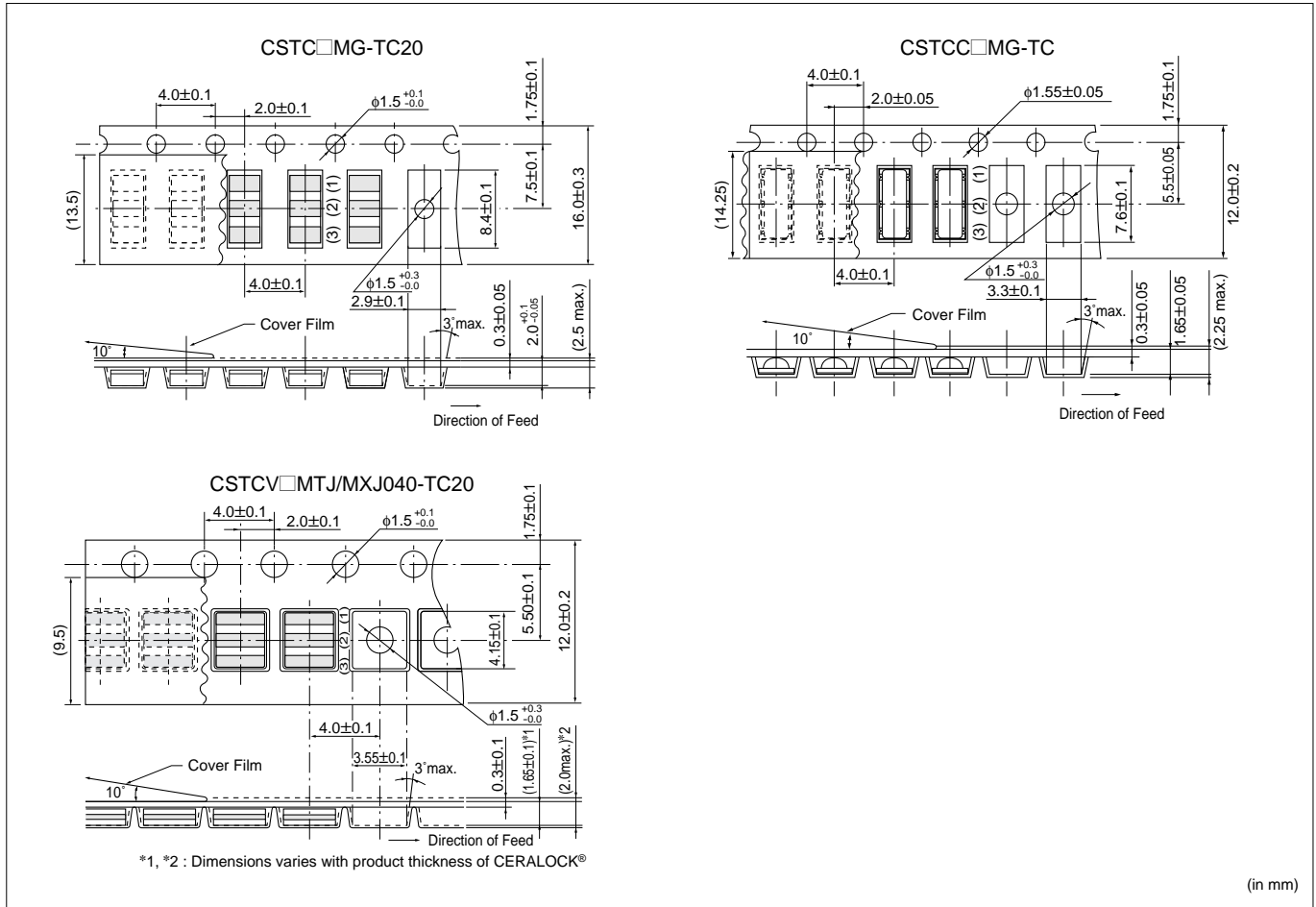


# CERAMIC RESONATOR



## Chip Ceramic Resonator **CSTC/CSTCC/CSTCV** Series

### ■ DIMENSIONS OF PLASTIC TAPE

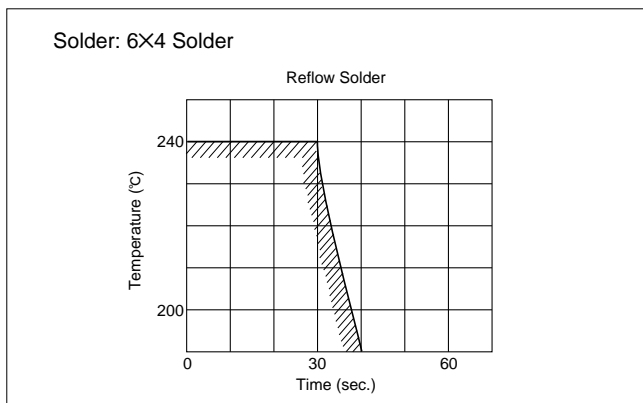


### ■ APPLICATIONS

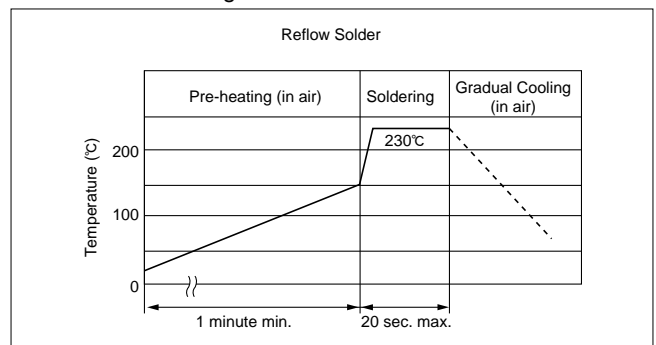
#### 1. Soldering Conditions

##### ● Soldering Temperature and Time

Solder within the temperature and time combinations illustrated by the slanted lines in the following graph. If soldering is repeated, please note that the allowed time is the accumulated time.



#### ● Standard Soldering Conditions



#### ● Soldering Method

Soldering conditions : Soldering iron temperature 270°C  
Soldering time less than 3 seconds

#### 2. Cleaning Conditions

Please contact us concerning cleaning method before use. For protection of ozone layer, we also investigate the non-ODC cleaning process for our devices. For more details, please contact us before use.



# CERAMIC RESONATOR



## Chip Ceramic Resonator CSAC/CSACV Series

### Wide range of chip CERALOCK® is now available.

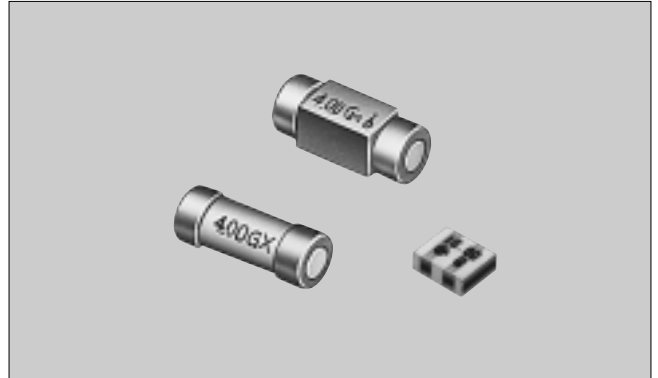
This diverse series owes its development to MURATA's package technology expertise and original mass production techniques. It enables high-density mounting and further miniaturization of electronic equipment.

#### FEATURES

1. The series is available in a wide frequency range.
2. The resonators are extremely small and have a low profile (CSACV series).
3. No adjustment is necessary for oscillation circuits.

#### APPLICATIONS

1. Clock oscillators for microprocessors.
2. Electronic control circuits for small electronic equipment.
3. Automotive electronics (CSAC series)
4. DTMF generators for cordless telephones.



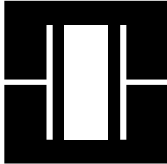
#### SPECIFICATIONS

| Item \ Type                                   | CSAC Series   | CSACV Series  |                |
|---|---------------|---------------|----------------|
|   | CSAC□MGC/MGCM | CSACV□MTJ*4   | CSACV□MXJ040*4 |
| Frequency Range                               | 1.80–6.00MHz  | 8.00–13.00MHz | 13.50–60.00MHz |
| Oscillation Frequency Initial Tolerance       | ±0.5%         | ±0.5%         | ±0.5%          |
| Oscillation Frequency Temperature Stability*1 | ±0.3%         | ±0.5%         | ±0.3%          |
| Aging*2                                       | ±0.3%         | ±0.5%         | ±0.3%          |

Oscillation Frequency Measuring Circuit

IC :1/6CD4069UBEX2\*3  
V<sub>DD</sub> :5V (MTJ series:12V)  
X :Chip CERALOCK®

\*1 At -20 to +80°C  
\*2 For 10 years at room temperature  
\*3 TC74HCU04 is used as the standard circuit for the MXJ040 series.  
\*4 CSACS series shall be recommended in automotive application.



# CERAMIC RESONATOR

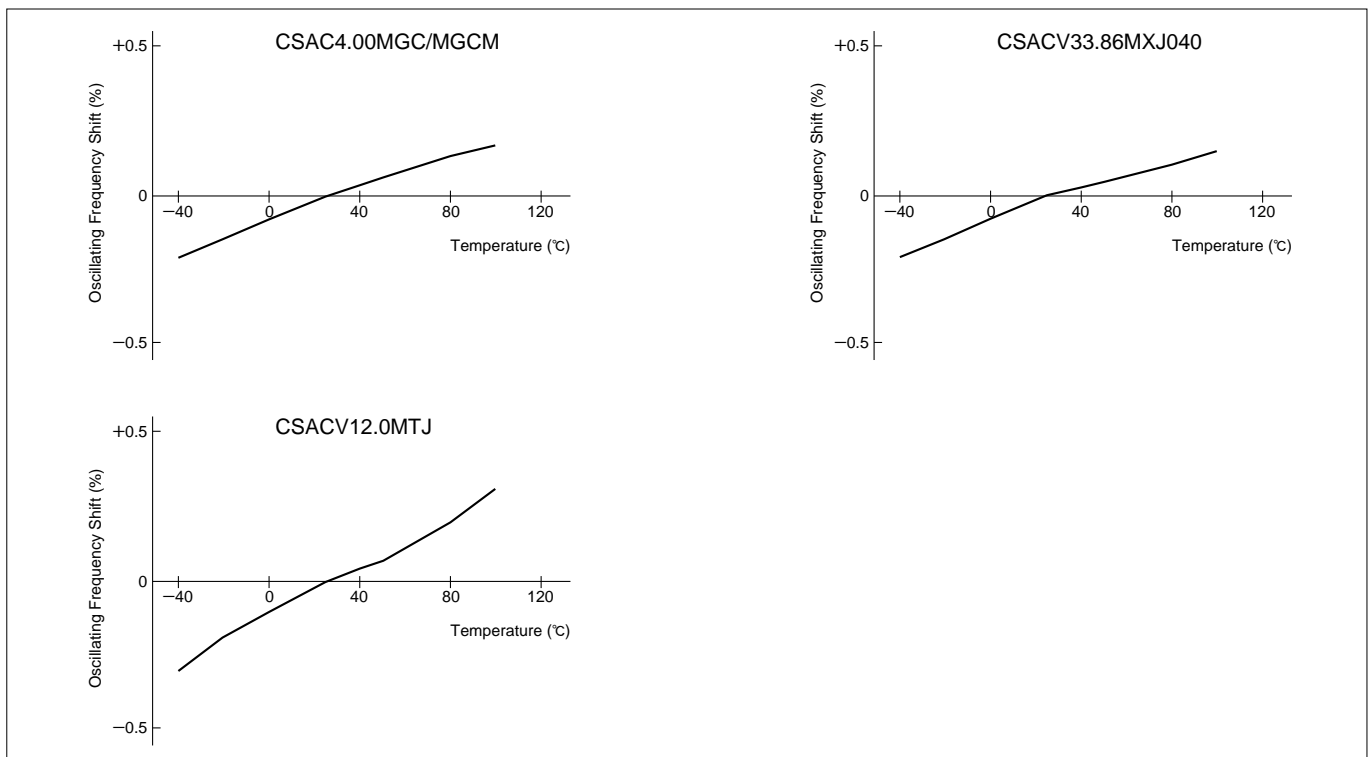


## Chip Ceramic Resonator CSAC/CSACV Series

### ■ DIMENSIONS/STANDARD LAND PATTERN (in mm)

| Frequency             | 1.80—6.00MHz                            | 8.01—13.00MHz | 13.50—60.00MHz   |
|-----------------------|---|---------------|--|
| Type                  | CSAC□MGC/MGCM                           | CSACV□MTJ     | CSACV□MXJ040   |
| Dimensions            | <p>(MGCM)</p> <p>(MGC)</p>              |               | <p>*Terminal (1) and (3) are interchangeable.<br/>Terminal (2) shall be soldered only to fix the resonator on to P.C.B..<br/>Terminal (2) shall be electrically floating so it shall not be connected to anywhere.<br/>*Thickness varies with frequency.</p> |
| Standard Land Pattern | <p>Legend:  Land Pattern  Electrode</p> |               |  |

### ■ THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



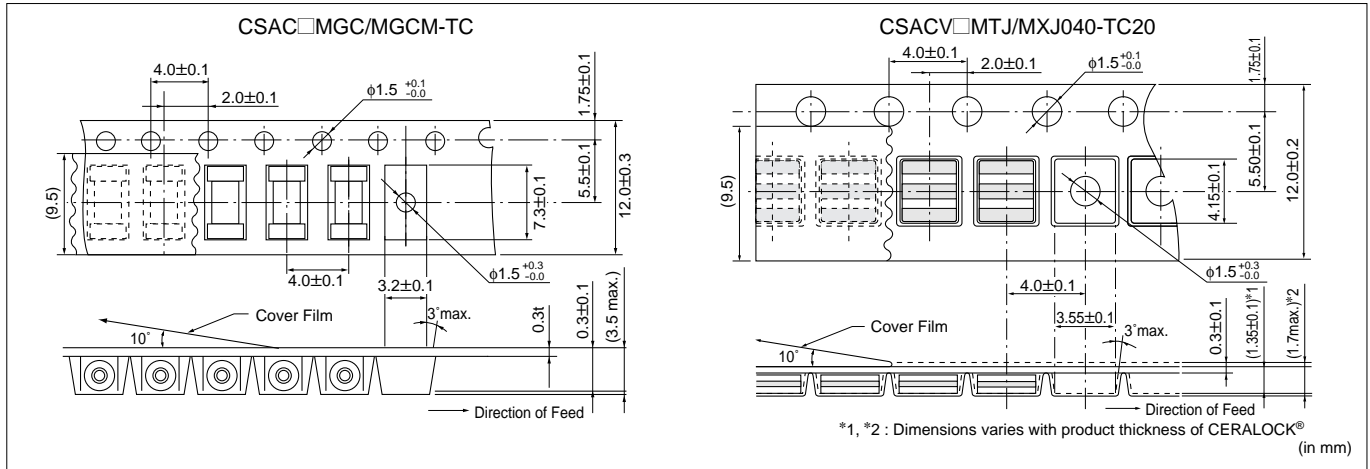


# CERAMIC RESONATOR



## Chip Ceramic Resonator CSAC/CSACV Series

### ■ DIMENSIONS OF PLASTIC TAPE

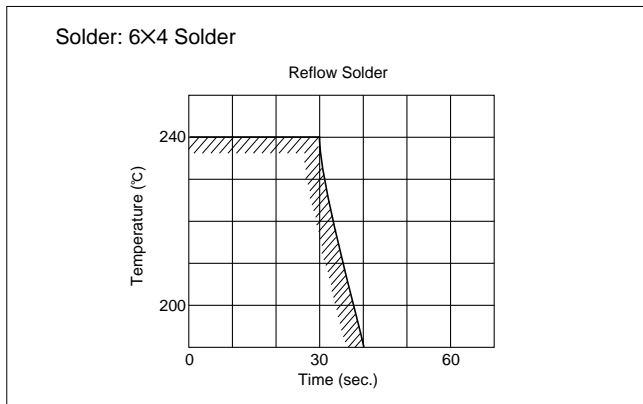


### ■ APPLICATIONS

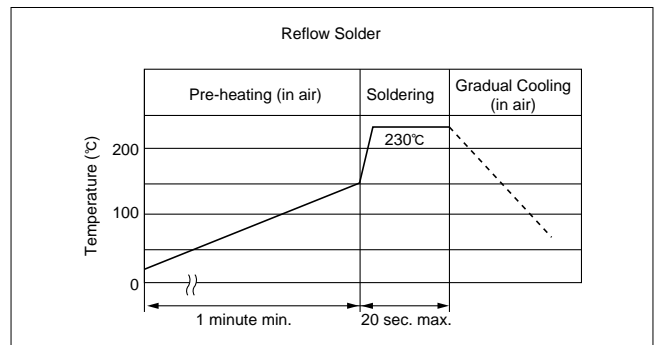
#### 1. Soldering Conditions

##### ● Soldering Temperature and Time

Solder within the temperature and time combinations illustrated by the slanted lines in the following graph. If soldering is repeated, please note that the allowed time is the accumulated time.



#### ● Standard Soldering Conditions



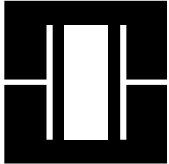
#### ● Soldering Method

Soldering conditions : Soldering iron temperature 270°C  
Soldering time less than 3 seconds

#### 2. Cleaning Conditions

Please contact us concerning cleaning method before use. For protection of ozone layer, we also investigate the non-ODC cleaning process for our devices. For more details, please contact us before use.





# CERAMIC RESONATOR



kHz Band SMD Ceramic Resonator **CSBF** Series

## Can be reflow soldered and mounted by automatic placers.

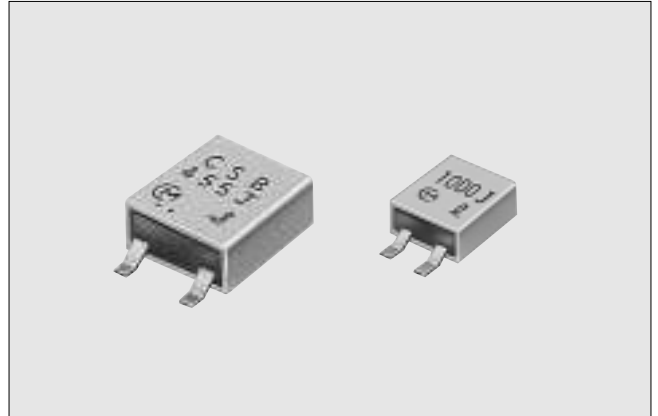
MURATA's original package technologies have enabled the development of the kHz band CERALOCK®. The series is perfect in miniature remote control units and A. V. modules.

### FEATURES

1. The series withstands reflow soldering.
2. The series is mountable by automatic placers.
3. Its high performance provides stable oscillation.

### APPLICATIONS

1. Clock oscillators for microprocessors.
2. OA equipment
3. AV modules



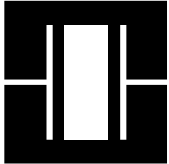
### SPECIFICATIONS

| Item \ Type                                   | CSBF Series   |             |
|---|---|-------------|
|   | CSBF□J  | CSBF□J      |
| Frequency Range                               | 430–519kHz  | 700–1250kHz |
| Oscillation Frequency Initial Tolerance       | ±0.5%   | ±0.5%       |
| Oscillation Frequency Temperature Stability*1 | ±0.3%   | ±0.3%       |
| Aging*2                                       | ±0.3%   | ±0.3%       |
| Oscillation Frequency Measuring Circuit       |   |             |
|   | IC :1/6CD4069UBEX2<br>V <sub>DD</sub> :5V<br>X :CERALOCK®<br>C <sub>1</sub> ,C <sub>2</sub> :100pF<br>R <sub>d</sub> :5.6kΩ*3 |             |

\*1 At -20 to +80°C

\*2 For 10 years at room temperature.

\*3 This resistance value applies to the 700-1250 kHz range.



# CERAMIC RESONATOR



## kHz Band SMD Ceramic Resonator **CSBF** Series

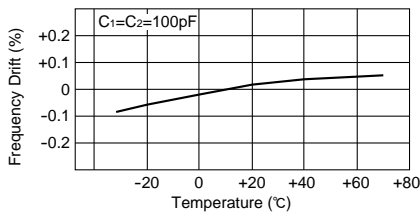
### ■ DIMENSIONS/STANDARD LAND PATTERN (in mm)

| Frequency             | 430–519kHz | 700–1250kHz |
|-----------------------|------------|-------------|
| Type                  | CSBF□J     | CSBF□J*1    |
| Dimensions            |            |             |
| Standard Land Pattern |            |             |

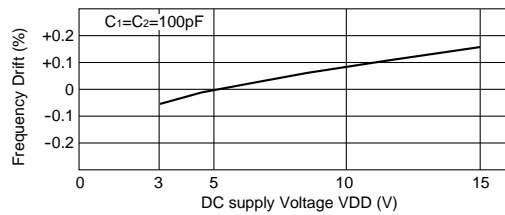
\*1 Available in several standard frequencies.

### ■ TECHNICAL DATA

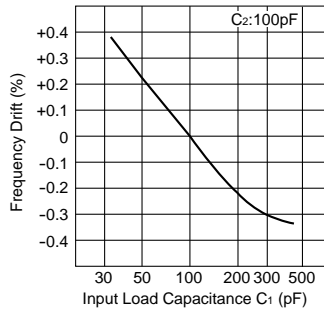
Temperature characteristics  
CSBF455J



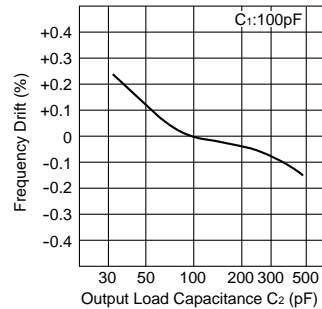
Supply voltage characteristics  
CSBF455J

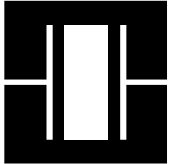


Input load capacitance (C1)  
characteristics  
CSBF455J



Output load capacitance (C2)  
characteristics  
CSBF455J



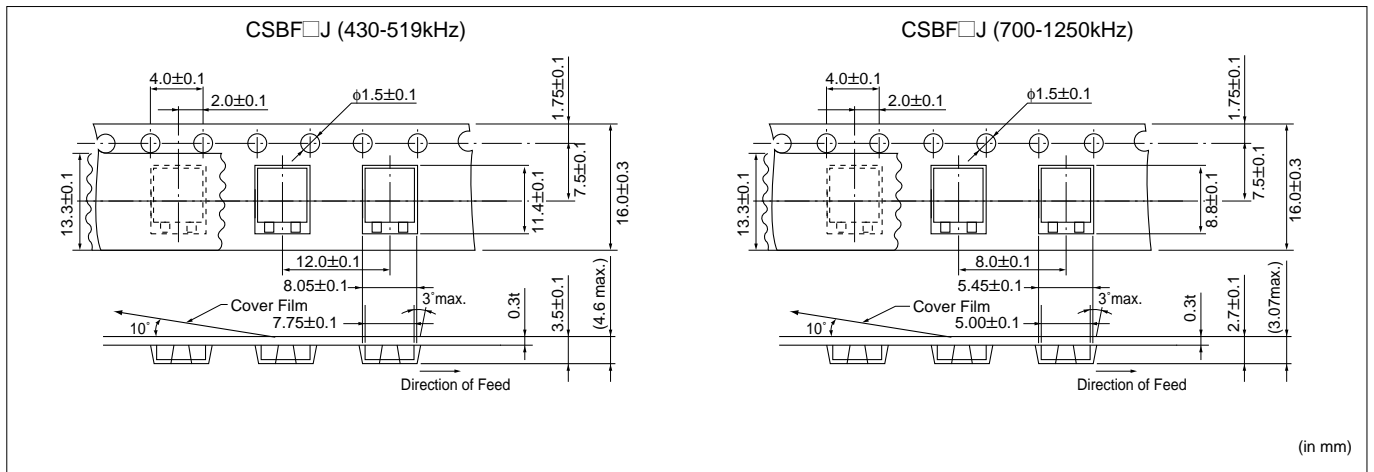


# CERAMIC RESONATOR



## kHz Band SMD Ceramic Resonator **CSBF** Series

### ■ DIMENSIONS OF PLASTIC TAPE

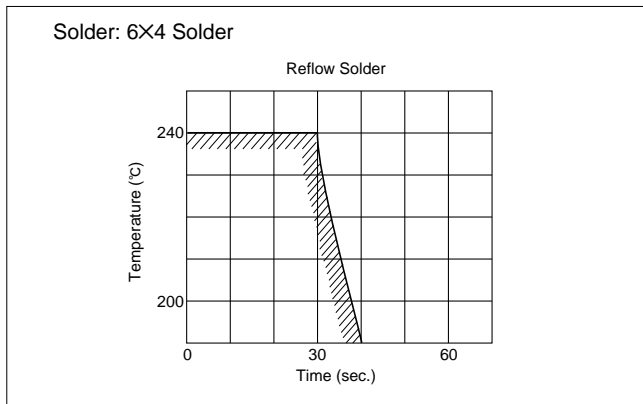


### ■ APPLICATIONS

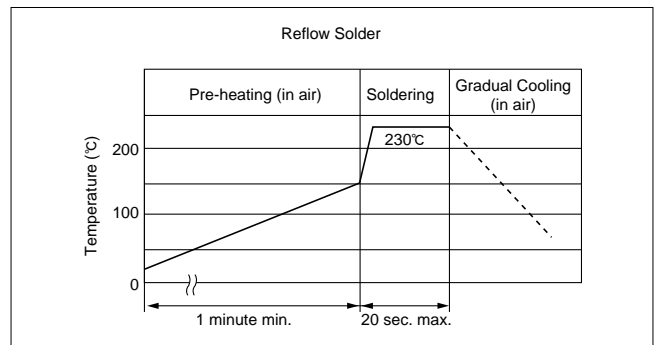
#### 1. Soldering Conditions

##### ● Soldering Temperature and Time

Solder within the temperature and time combinations illustrated by the slanted lines in the following graph. If soldering is repeated, please note that the allowed time is the accumulated time.



#### ● Standard Soldering Conditions



#### ● Soldering Method

Soldering conditions : Soldering iron temperature 270°C  
Soldering time less than 3 seconds

#### 2. Cleaning Conditions

Please contact us concerning cleaning method before use. For protection of ozone layer, we also investigate the non-ODC cleaning process for our devices. For more details, please contact us before use.



# CERAMIC RESONATOR

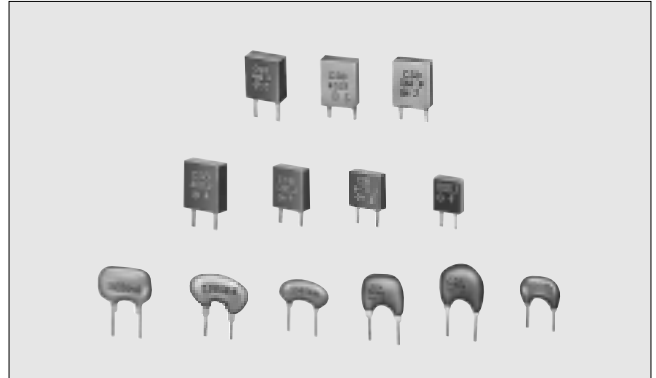
Ceramic Resonator **CSA/CSB** Series



## CERALOCK<sup>®</sup> with two leaded terminals.

The CSA and CSB series ceramic resonator owe their development to MURATA's innovative expert technologies and the application of mass production techniques typically utilized in the manufacture of piezoelectric ceramic components. Because of their high mechanical Q and consistent high quality, both the CSA and CSB series are ideally suited to microprocessor and remote control unit applications.

The CSB series includes the thin and compact J type which is ideal in high-speed 4-bit microprocessor applications. In addition, MURATA offers a special CERALOCK<sup>®</sup> version suitable for automatic insertion utilizing tape and reel and other packaging forms. For further information, please contact your local MURATA representative office or authorized distributor.



### ■FEATURES

1. The series is stable over a wide temperature range and with respect to long-term aging.
2. The series comprises fixed, tuned, solid-state devices.
3. The resonators are miniature and light weight.
4. They exhibit excellent shock resistance performance.
5. Oscillating circuits requiring no adjustment can be designed by utilizing these resonators in conjunction with transistors or appropriate ICs.

### ■APPLICATIONS

1. Square-wave and sine-wave oscillator.
2. Clock generator for microprocessors.
3. Tone Dialers and Pulse Dialers for telephone.
4. Remote control systems.
5. Automotive electronics (engine control, digital speed meters, etc.)



# CERAMIC RESONATOR



## Ceramic Resonator CSA/CSB Series

### SPECIFICATIONS

| Item  | Type | CSA Series  |              |               |  | CSB Series  |   |  |
|---|------|---|--------------|---------------|--|-------------|---|--|
|   |      | CSA□MK  | CSA□MG       | CSA□MTZ       | CSA□MXZ040   | No Washable | Washable*6  |  |
| Frequency Range                               |      | 1.26–1.79MHz  | 1.80–6.30MHz | 6.31–13.00MHz | 13.01–60.00MHz   | 375–699kHz  | 375–1250kHz   |  |
| Oscillation Frequency Initial Tolerance       |      | ±0.5%   |              |               |  | ±2kHz       | ±0.5kHz   |  |
| Oscillation Frequency Temperature Stability*1 |      | ±0.3%   |              | ±0.5%         | ±0.3%  |             | ±0.3%   |  |
| Aging*2                                       |      | ±0.3%   |              | ±0.5%         | ±0.3%  |             | ±0.5%   |  |
| Oscillation Frequency Measuring Circuit       |      | <p>IC :1/6CD4069UBEX2<br/> V<sub>DD</sub> :5V (MTZ series:12V)<br/> X :CERALOCK®<br/> C<sub>1</sub>,C<sub>2</sub> :30pF</p> |              |               | <p>IC :1/6TC74HCU04X2<br/> V<sub>DD</sub> :5V<br/> X :CERALOCK®<br/> C<sub>1</sub>,C<sub>2</sub> :30pF*5</p> |             | <p>IC :1/6CD4069UBEX2<br/> V<sub>DD</sub> :5V<br/> X :CERALOCK®<br/> C<sub>1</sub>,C<sub>2</sub> :Load Capacitors*3<br/> R<sub>d</sub> :5.6kΩ*4</p> |  |

\*1 At -20 to +80°C

\*2 For 10 years at room temperature.

\*3 Values vary according to frequency. Please contact us for details.

\*4 700–1250kHz (J Type) only.

\*5 For the MXZ040 series, the value changes according to frequency.

\*6 Washing the resonator is allowed. However, temperature, time and other washing conditions should be evaluated to confirm that stable electrical characteristics are maintained.

### DIMENSIONS

| Standard Products | Frequency            | 375–429kHz  | 430–509kHz | 510–699kHz |            |            | —           |
|-------------------|----------------------|-------------|------------|------------|------------|------------|-------------|
|                   |                      | Part Number | CSB□P      | CSB□E      | CSB□P      |            |             |
| Not Washable      | Dimensions (in mm)   |             |            |            |            |            |             |
|                   | Frequency            | 375–429kHz  | 430–519kHz | 520–589kHz | 590–655kHz | 656–699kHz | 700–1250kHz |
| Washable          | Part Number          | CSB□J*      | CSB□J*     | CSB□J*     | CSB□JR*    | CSB□J*     | CSB□J*      |
|                   | Ultrasonic Cleaning* | ALLOWED     | ALLOWED    | ALLOWED    | ALLOWED    | ALLOWED    | ALLOWED     |
| Standard Products | Dimensions (in mm)   |             |            |            |            |            |             |

\* Please consult MURATA regarding ultrasonic cleaning conditions to avoid possible damage during ultrasonic cleaning.



# CERAMIC RESONATOR

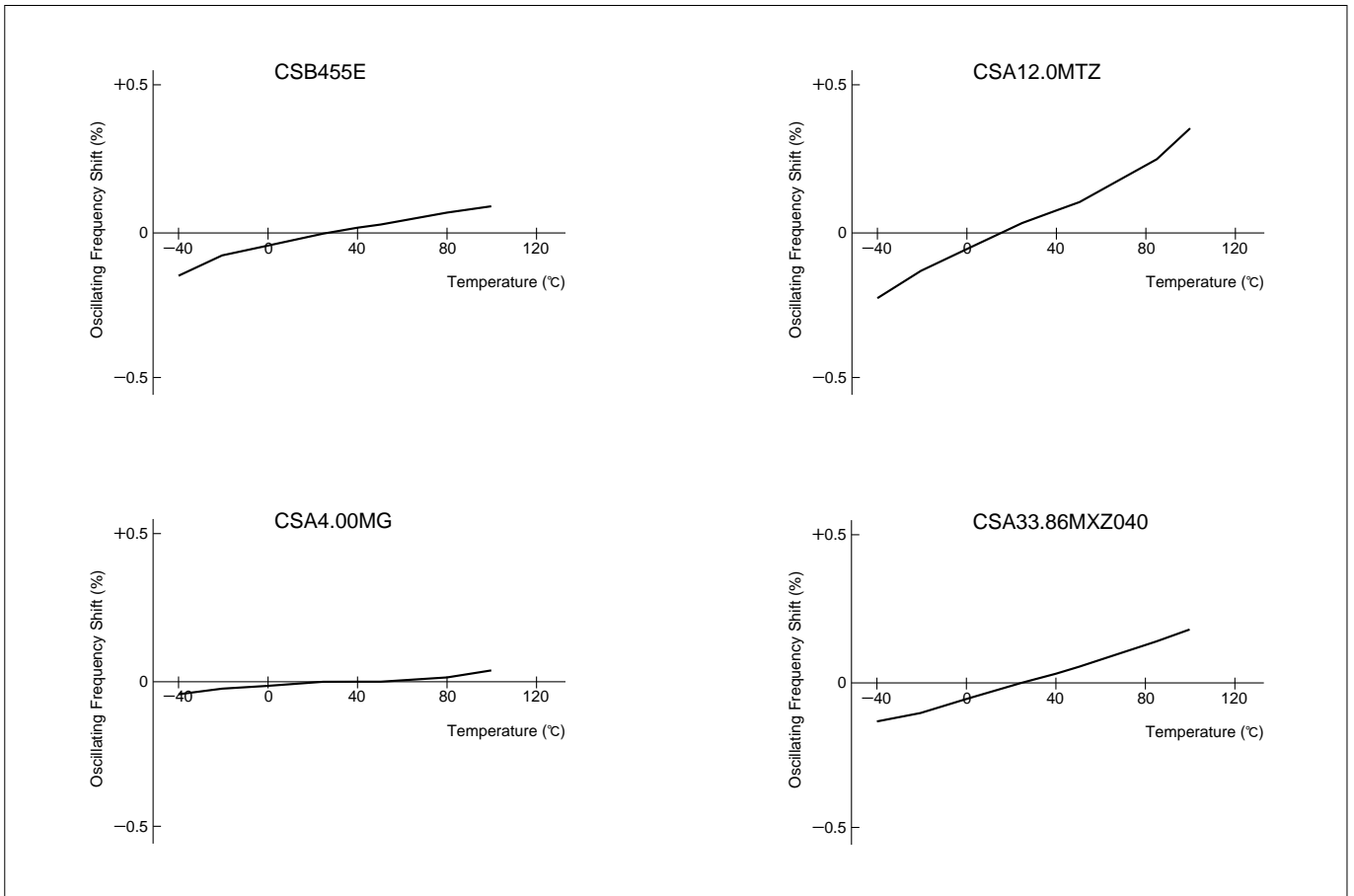


## Ceramic Resonator CSA/CSB Series

| Frequency          | 1.26–1.79MHz    | 1.80–2.44MHz              | 2.45–6.30MHz              | 6.31–13.00MHz                    | 13.01–32.99MHz                                  | 33.00–60.00MHz                                  |
|--------------------|-----------------|---------------------------|---------------------------|----------------------------------|---|---|
| Part Number        | CSA□MK*         | CSA□MG                    | CSA□MG                    | CSA□MTZ                          | CSA□MXZ   | CSA□MXZ   |
| Oscillation Mode*  | Shear Vibration | Thickness Shear Vibration | Thickness Shear Vibration | Thickness Longitudinal Vibration | Thickness Longitudinal Vibration (3rd OVERTONE) | Thickness Longitudinal Vibration (3rd OVERTONE) |
| Dimensions (in mm) |                 |                           |                           |                                  |   |   |

\* The CSA□MK type is not washable.

### THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION





# CERAMIC RESONATOR



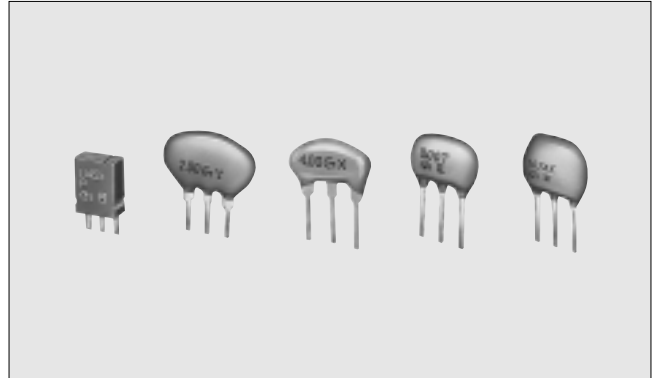
## Ceramic Resonator CSU/CST Series

### CERALOCK<sup>®</sup> with built in loading capacitors.

MURATA's ceramic resonator, CERALOCK<sup>®</sup>, has been widely applied as the most suitable component for clock oscillators in a broad range of microprocessors. The CSU series (kHz band) and CST series (MHz band) can be used in the design of oscillation circuits not requiring external load capacitors, enabling both high-density mounting and cost reduction.

#### FEATURES

1. Oscillation circuits do not require external load capacitors.
2. The series is stable over a wide temperature range.
3. The resonators are compact, light weight and exhibit superior shock resistance performance.
4. They enable the design of oscillator circuits requiring no adjustment.
5. The series is inexpensive and available in stable supply.
6. There are some variation of built-in capacitance value to apply various of IC.



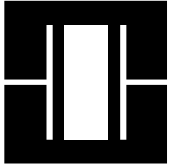
#### APPLICATIONS

1. DTMF generators • Remote control units
2. Clock oscillators for microcomputers
3. Automated office equipment
  - Automotive electronics (Suffixed "-A" ex. CST□MGWA)

#### SPECIFICATIONS

| Item  | Type   | CST Series  |              |               |                |
|---|--|---|--------------|---------------|----------------|
|   | CSU Series   | CST□MG  | CST□MGW      | CST□MTW       | CST□MXW040     |
| Frequency Range                               | 450–500kHz   | 1.80–2.44MHz  | 2.45–6.30MHz | 6.31–13.00MHz | 13.01–60.00MHz |
| Oscillation Frequency Initial Tolerance       | ±2kHz  | ±0.5%   | ±0.5%        | ±0.5%         | ±0.5%          |
| Oscillation Frequency Temperature Stability*1 | ±0.3%  | ±0.3%   | ±0.3%        | ±0.4%         | ±0.3%          |
| Aging*2                                       | ±0.5%  | ±0.3%   | ±0.3%        | ±0.3%         | ±0.3%          |
| Oscillation Frequency Test Circuit            | <p>IC :1/6CD4069UBEX2<br/>V<sub>DD</sub> :5V<br/>X :CERALOCK<sup>®</sup></p> | <p>IC :1/6CD4069UBEX2*3<br/>V<sub>DD</sub> :5V (MTW series:12V)<br/>X :CERALOCK<sup>®</sup></p> |              |               |                |

\*1 At -20 to +80°C (Temperature Condition)  
 \*2 For 10years at room temperature .  
 \*3 TC74HCU04 is used as the standard circuit for the MXW040 series.  
 \*4 Input terminal (1) should be connected to the input of an inverter.  
 \*5 If connected with incorrect orientation, the above specification may not be guaranteed.



# CERAMIC RESONATOR



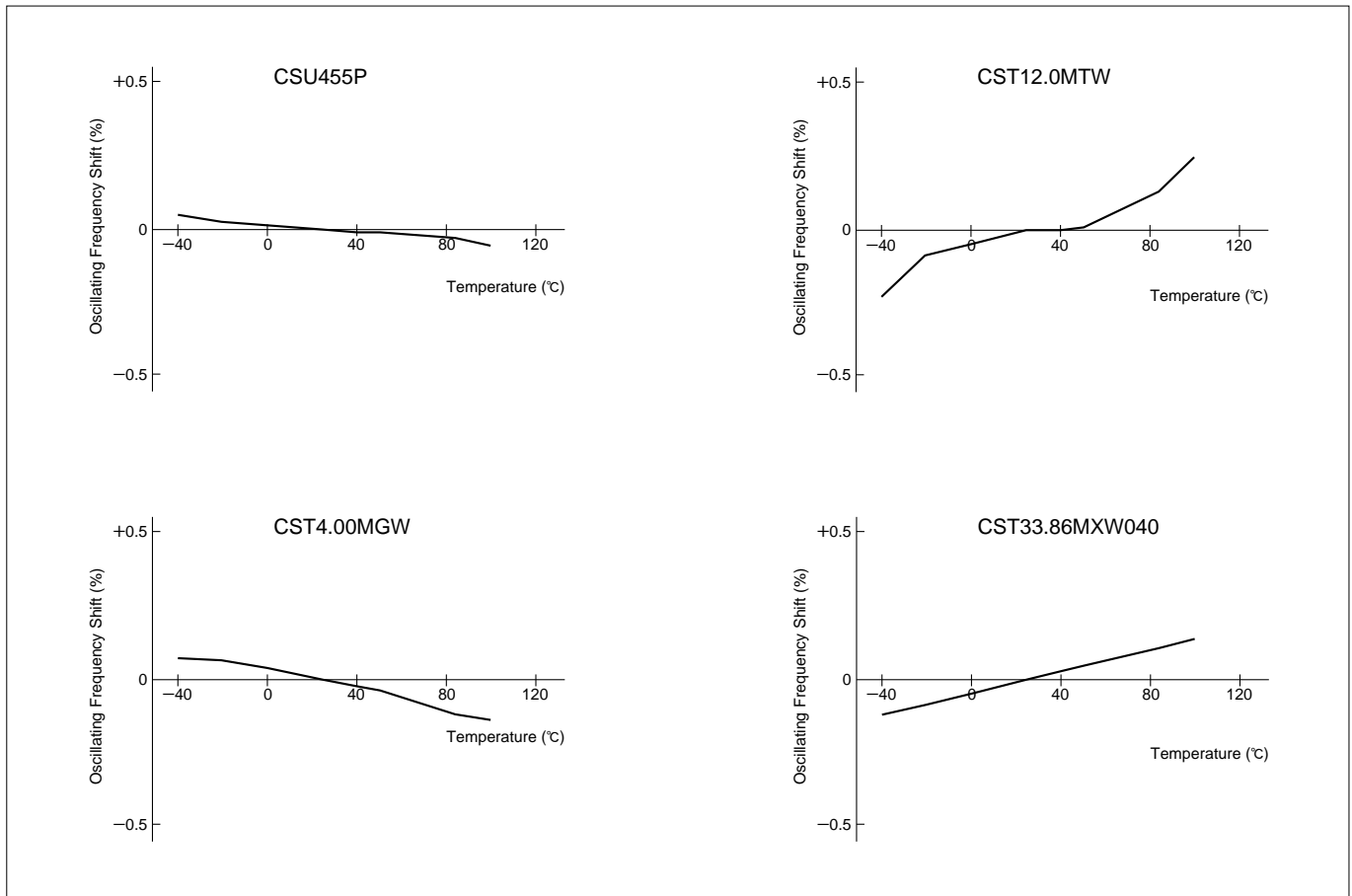
## Ceramic Resonator CSU/CST Series

### ■ DIMENSIONS

| Frequency          | 450—500kHz | 1.80—2.44MHz | 2.45—6.30MHz | 6.31—13.00MHz | 13.01—60.00MHz |
|--------------------|------------|--------------|--------------|---------------|----------------|
| Part Number        | CSU□P*4    | CST□MG       | CST□MGW      | CST□MTW       | CST□MXW        |
| Dimensions (in mm) |            |              |              |               |                |

- \*1 6.31—7.99MHz: 9.0mm max.
- \*2 13.01—14.99MHz: 9.0mm max., 33.00—60.00MHz:7.0mm max.
- \*3 Terminals have directionality : (1) Input (2) Ground (3) Output
- \*4 The CSU□P is not washable.

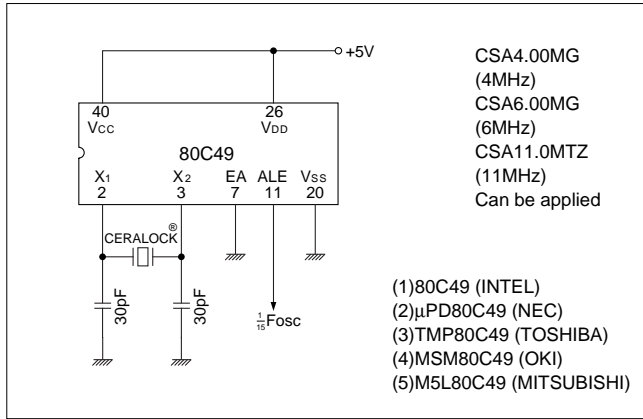
### ■ THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



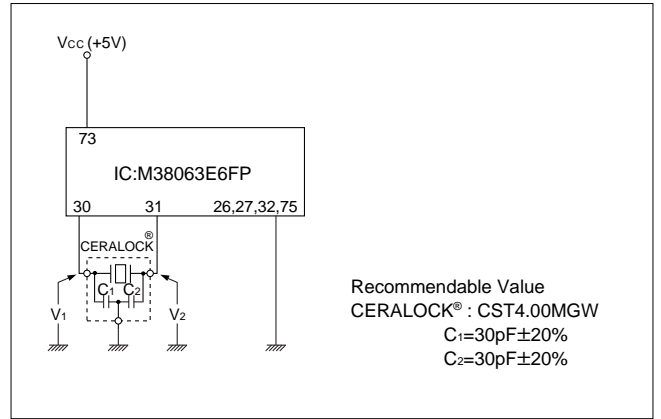


■APPLICATION CIRCUITS UTILIZING THE CERALOCK®

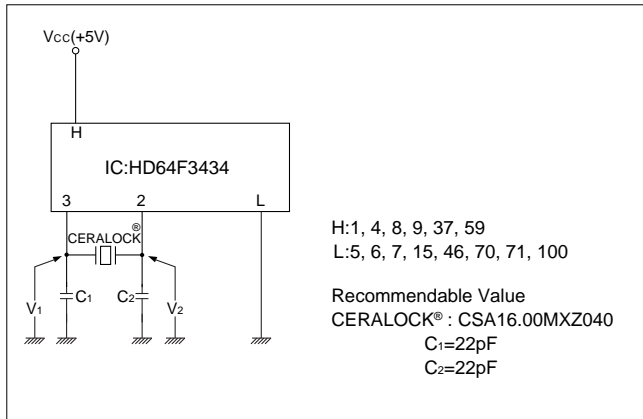
Application to 80C49 (8-bit Microcomputer)



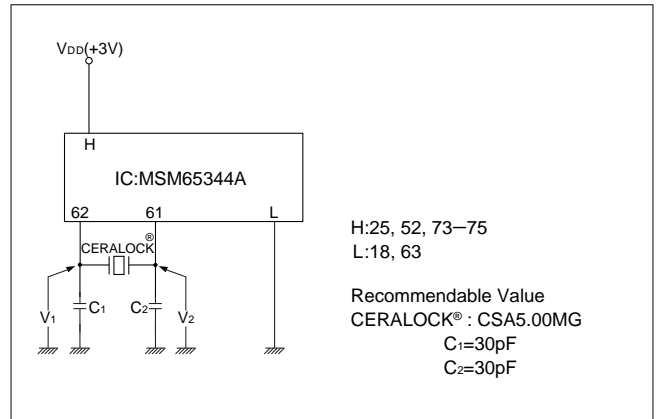
Application to M38063E6FP (MITSUBISHI) (8-bit Microcomputer)



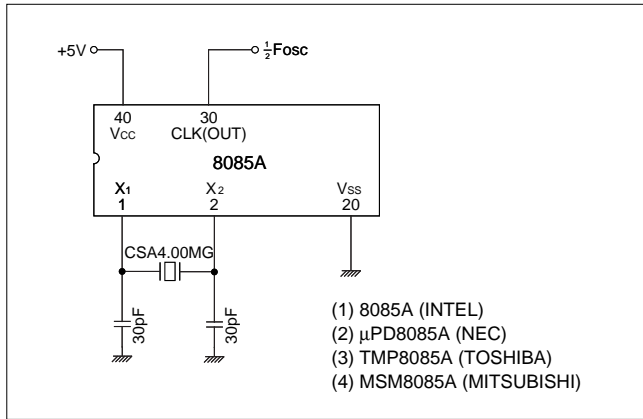
Application to HD64F3434 (HITACHI) (8-bit Microcomputer)



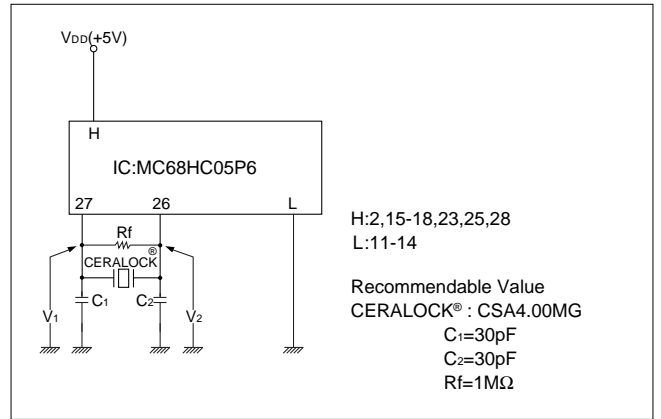
Application to MSM65344A (8-bit Microcomputer)



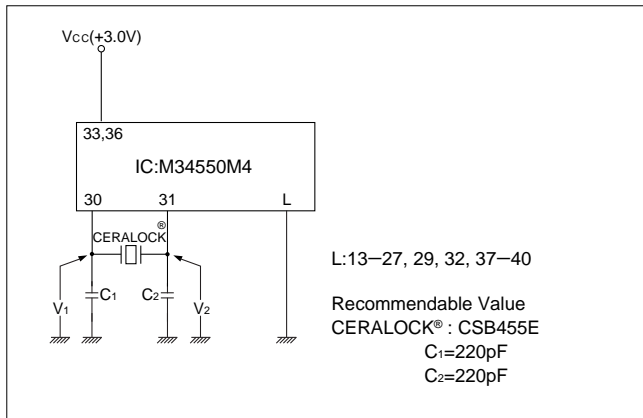
Application to 8085 (8-bit Microcomputer)



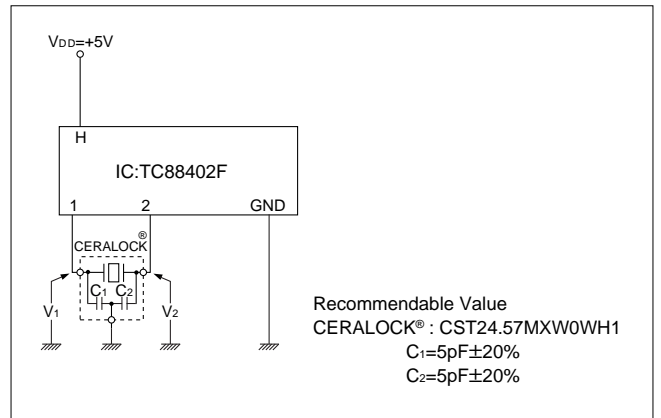
Application to MC68HC05P6 (MOTOROLA) (8-bit Microcomputer)



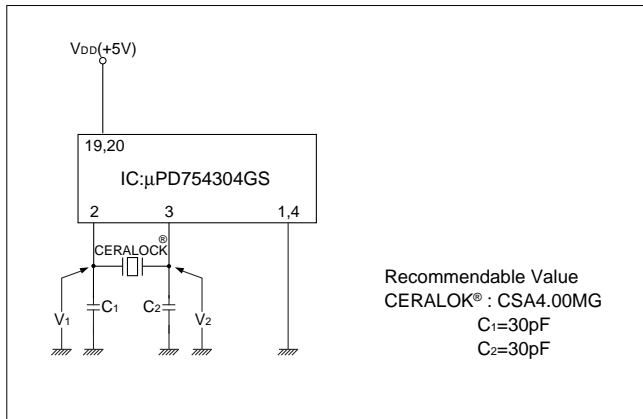
Application to M34550M4 (MITSUBISHI) (Remote Control Unit)



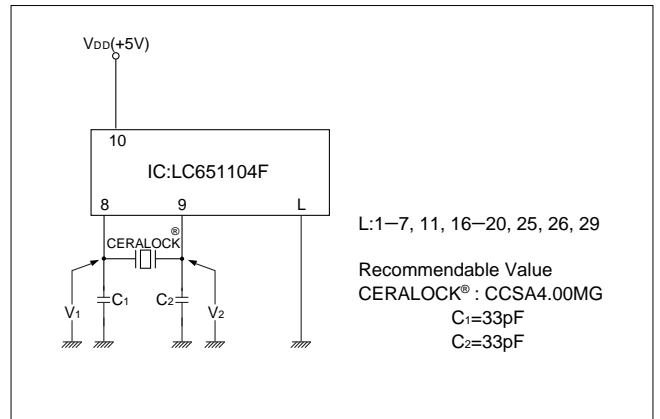
Application to TC88402F (TOSHIBA) (Speech Synthesizer)



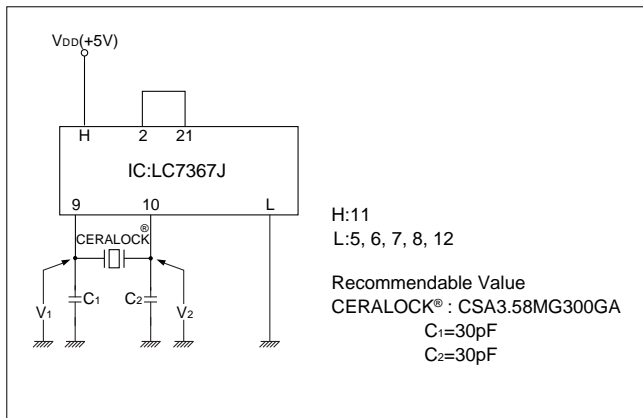
Application to  $\mu$ PD754304GS (4-bit Microcomputer)



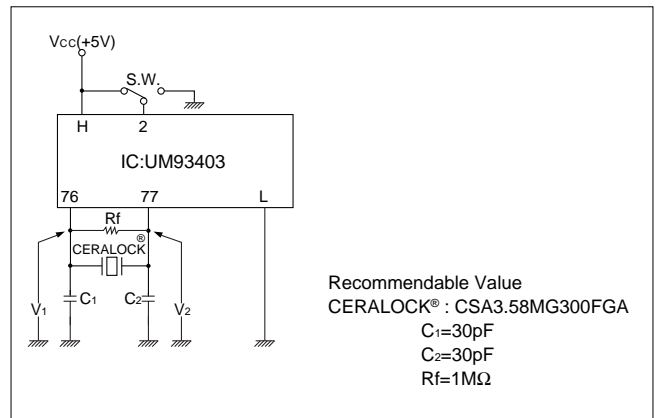
Application to 651104F (SANYO) (4-bit Microcomputer)



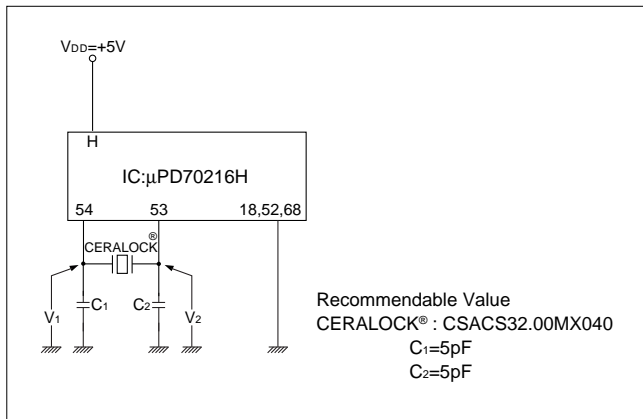
Application to LC7367J (SANYO) (Tone / Pulse Dialer)



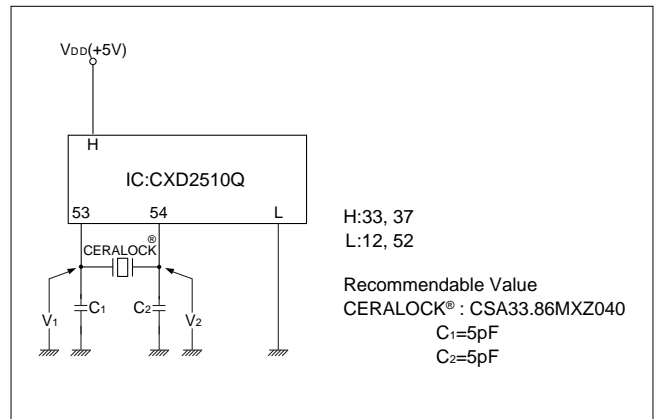
Application to UM93403 (UMC) (Tone / Pulse Dialer)



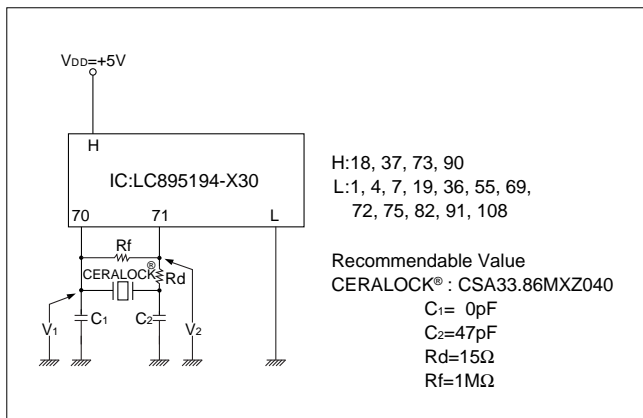
Application to  $\mu$ PD70216H (NEC) (16-bit Microcomputer)



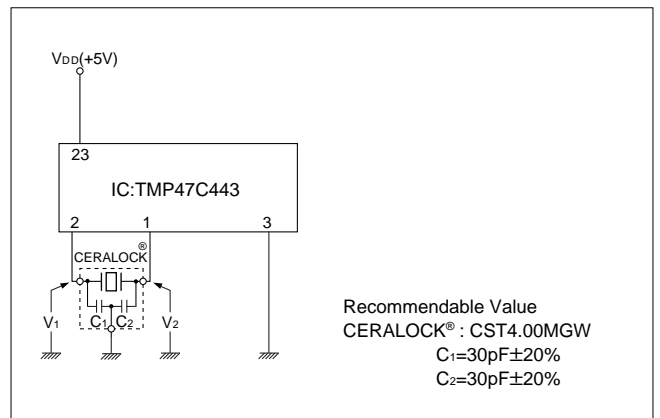
Application to CXD2510Q (SONY) (Digital Signal Processing IC for CD)



Application to LC895194-X30 (SANYO)



Application to TMP47C443 (TOSHIBA) (4-bit Microcomputer)





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- ③ Undersea equipment
- ④ Medical equipment
- ⑤ Transportation equipment (automobiles, trains, ships, etc.)
- ⑥ Traffic signal equipment
- ⑦ Disaster prevention / crime prevention equipment
- ⑧ Data-processing equipment
- ⑨ Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

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