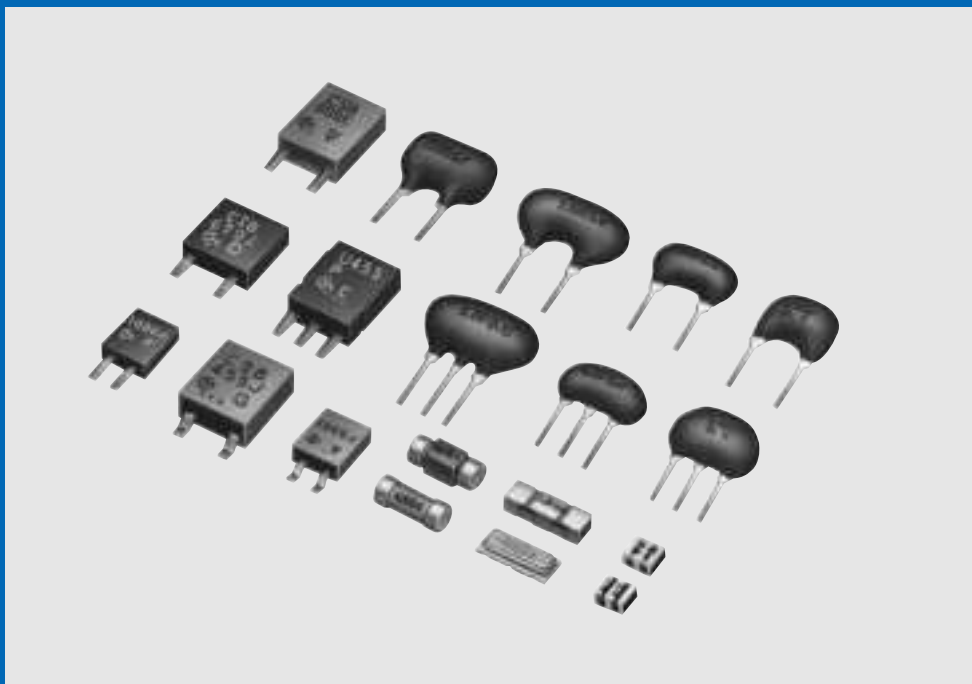




CERAMIC RESONATOR (CERALOCK®)

CERAMIC RESONATOR (CERALOCK®)



muRata

*Innovator
in Electronics*

Murata
Manufacturing Co., Ltd.

Cat.No.P16E-10

■CONTENTS

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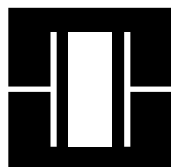
Application Circuits 15—17

*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 in 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

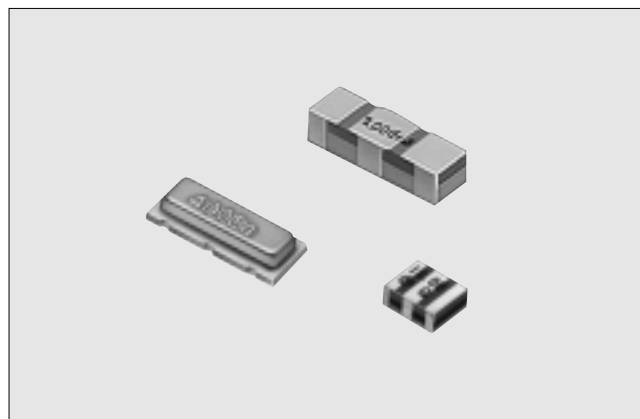
Chip CERALOCK® with built-in load capacitance in an extremely small package.

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

Type Item	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_{DD} :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.

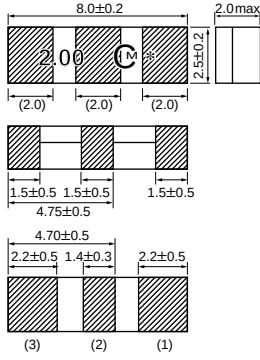
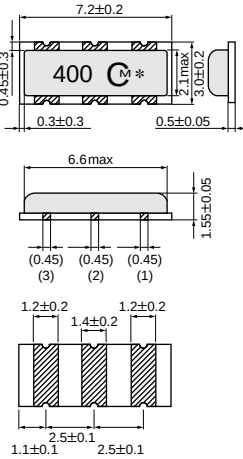
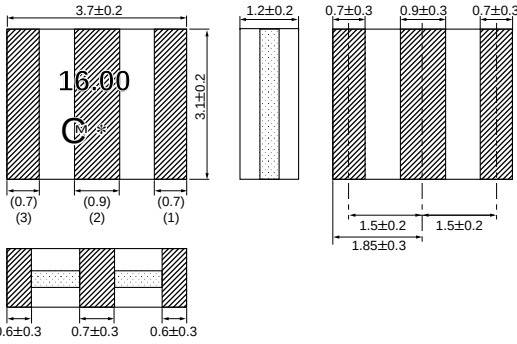
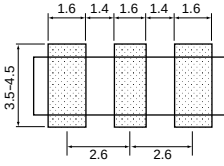
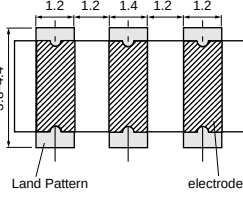
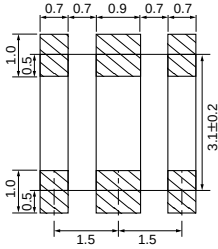
*5 If connected with incorrect orientation, the above specification may not be guaranteed.

*6 CSTCS series shall be recommended in automotive application.

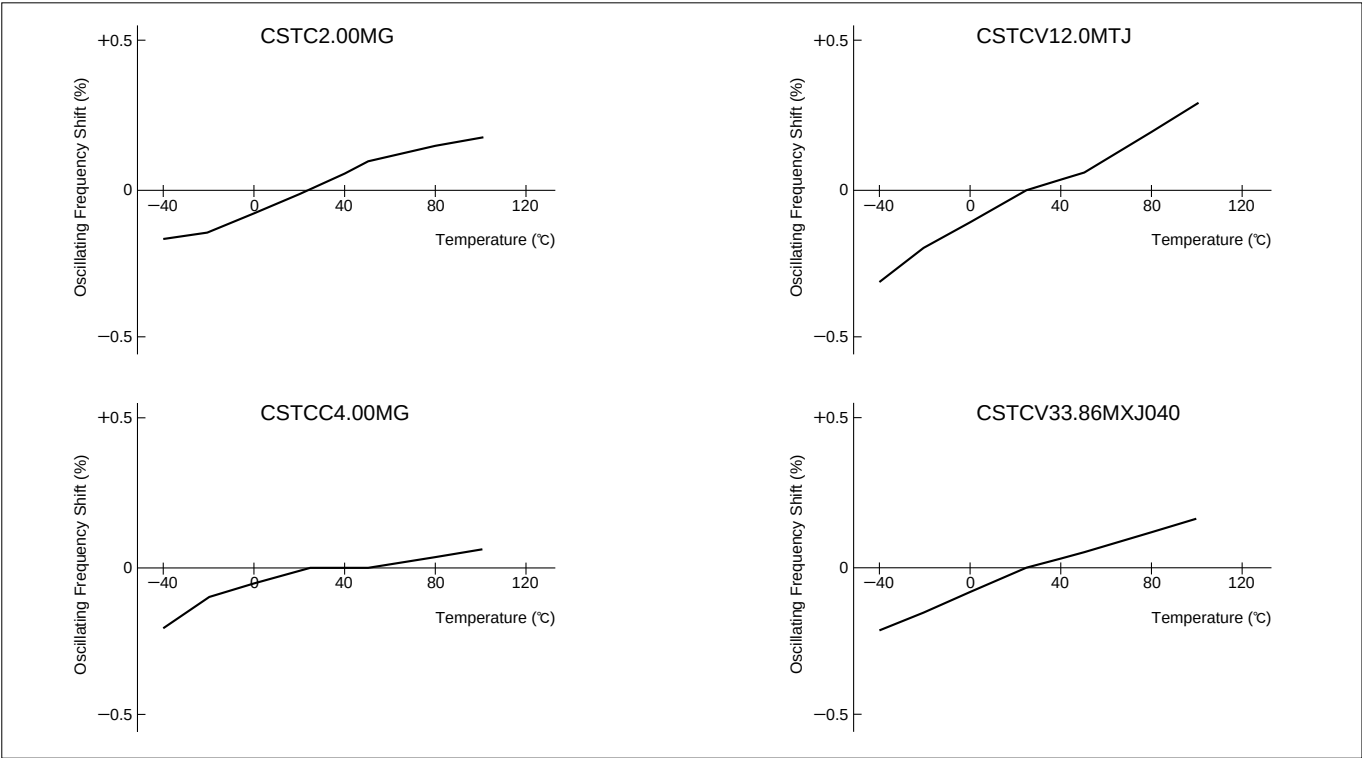
CERAMIC RESONATOR

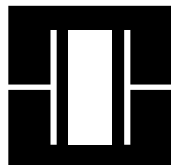
Chip Ceramic Resonator **CSTC/CSTCC/CSTCV** Series

■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				
Standard Land Pattern				

■THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION

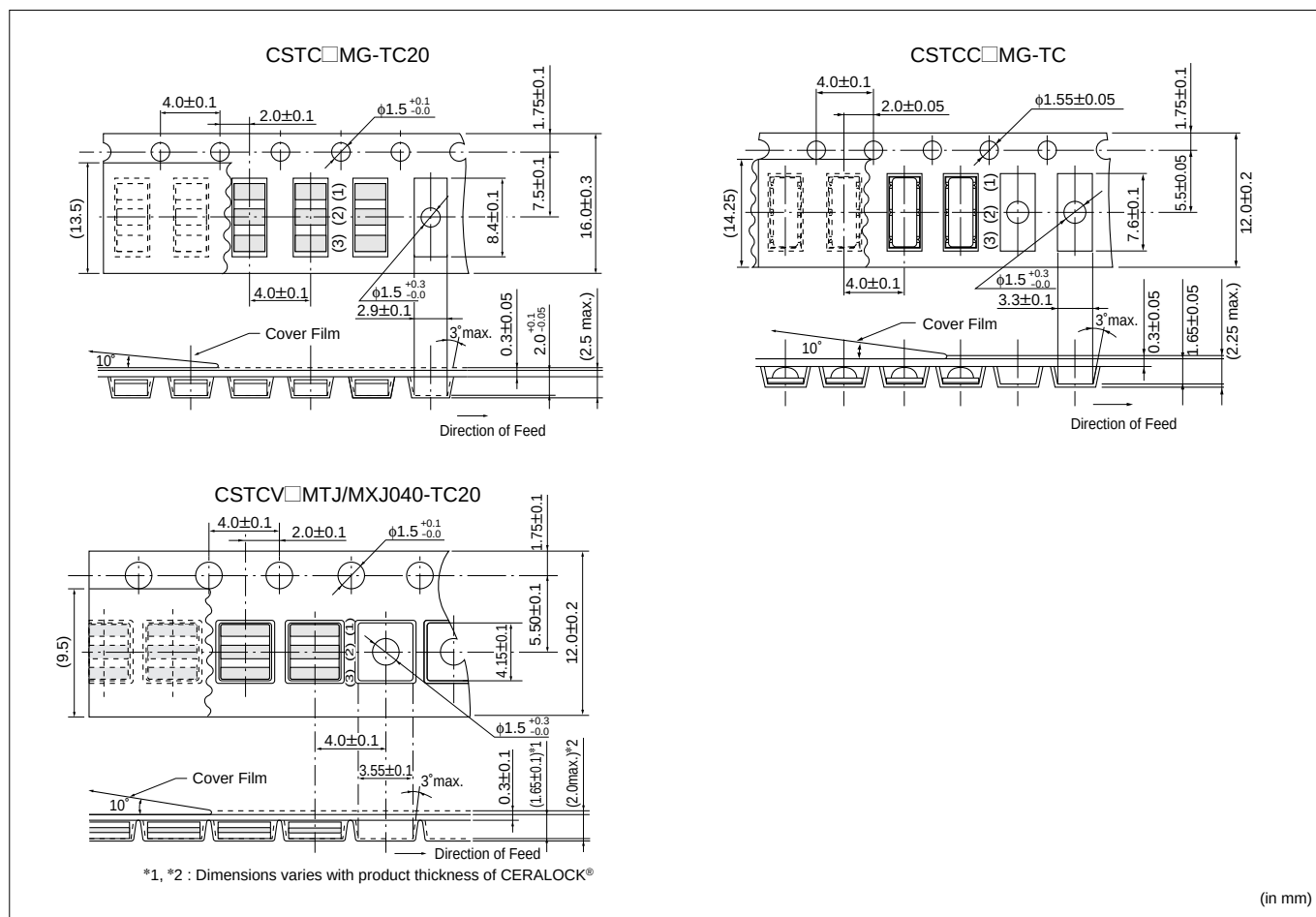




CERAMIC RESONATOR

Chip Ceramic Resonator CSTC/CSTCC/CSTCV Series

■ DIMENSIONS OF PLASTIC TAPE

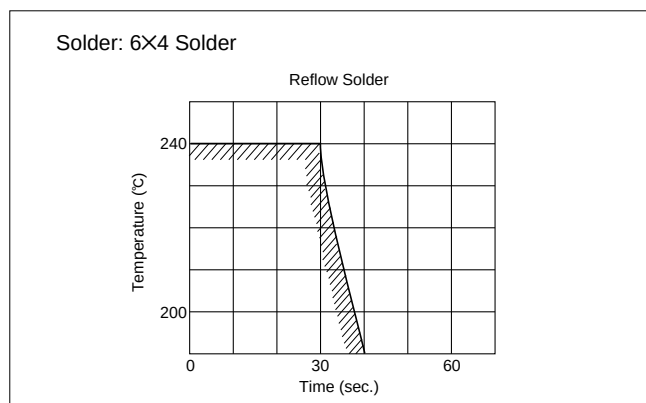


■ APPLICATIONS

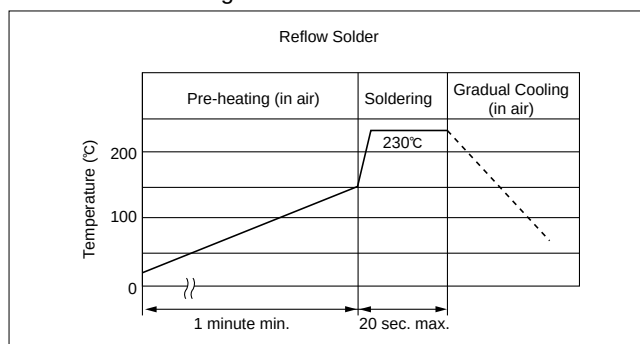
1. Soldering Conditions

● 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.

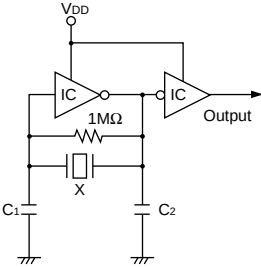
FEATURES

- 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.

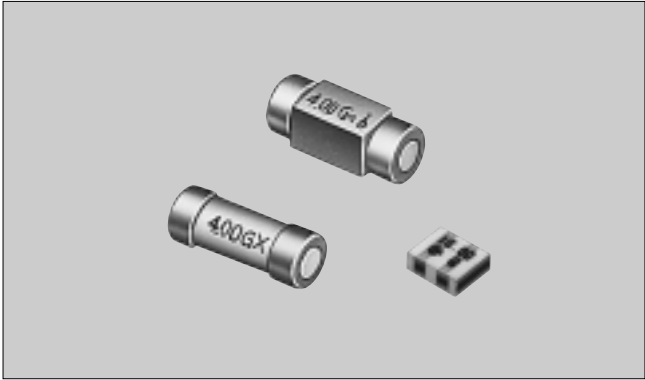
APPLICATIONS

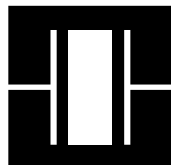
- 1. Clock oscillators for microprocessors.
- 2. Electronic control circuits for small electronic equipment.
- 3. Automotive electronics (CSAC series)
- 4. DTMF generators for cordless telephones.

SPECIFICATIONS

Type Item	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 VDD :5V (MTJ series:12V) X :Chip CERALOCK®		

*1 At -20 to +80℃
*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.



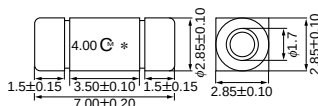
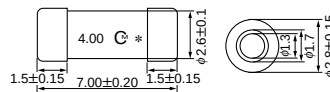
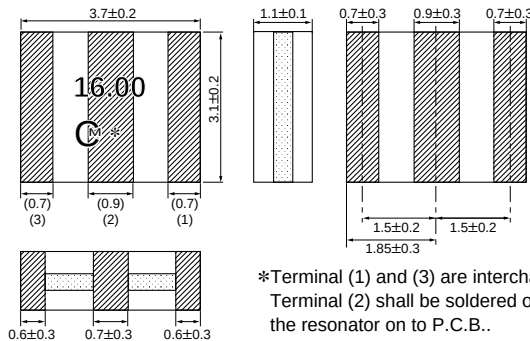
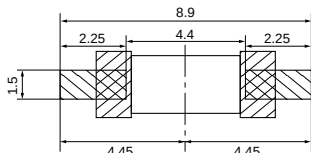
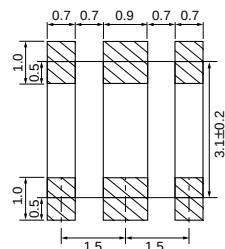


CERAMIC RESONATOR

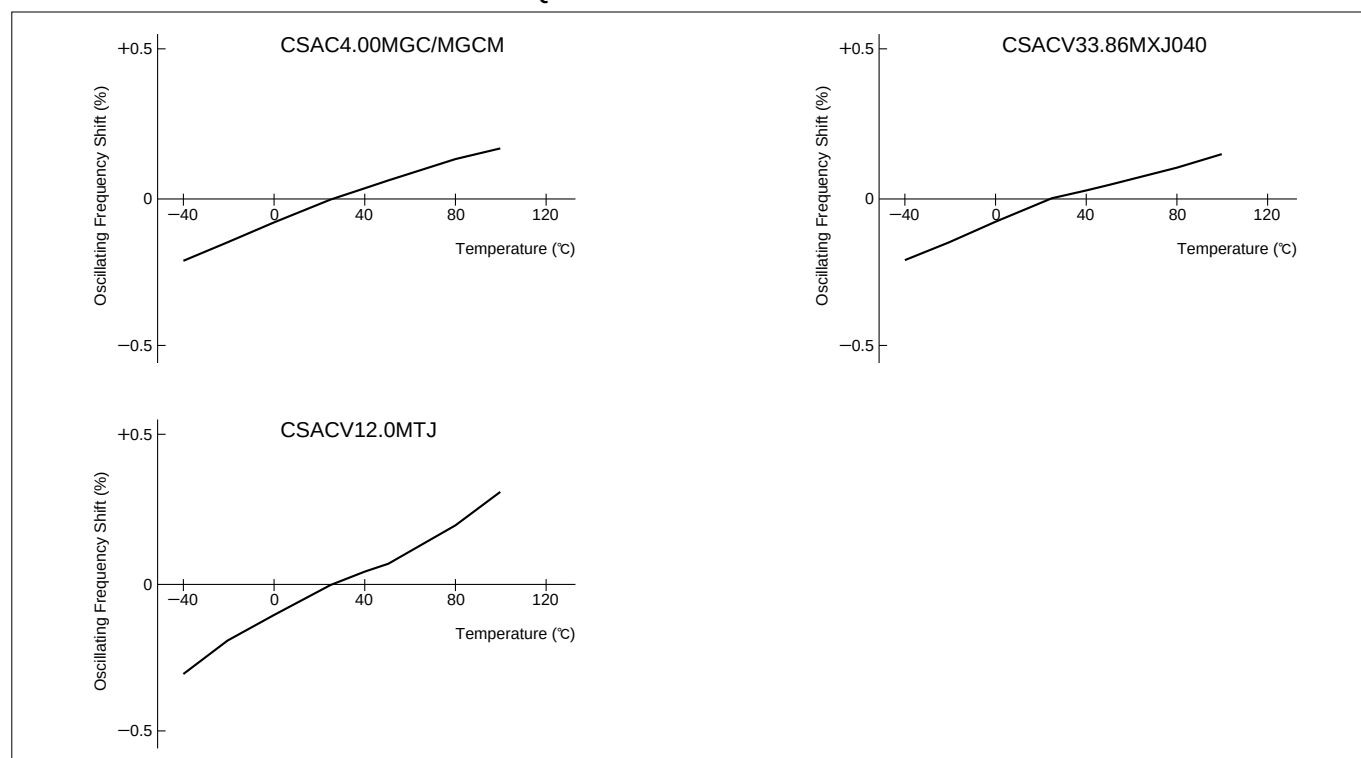
Chip Ceramic Resonator **CSAC/CSACV** Series

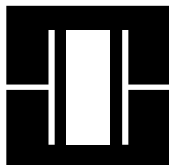


■ DIMENSIONS/STANDARD LAND PATTERN (in mm)

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

■ THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



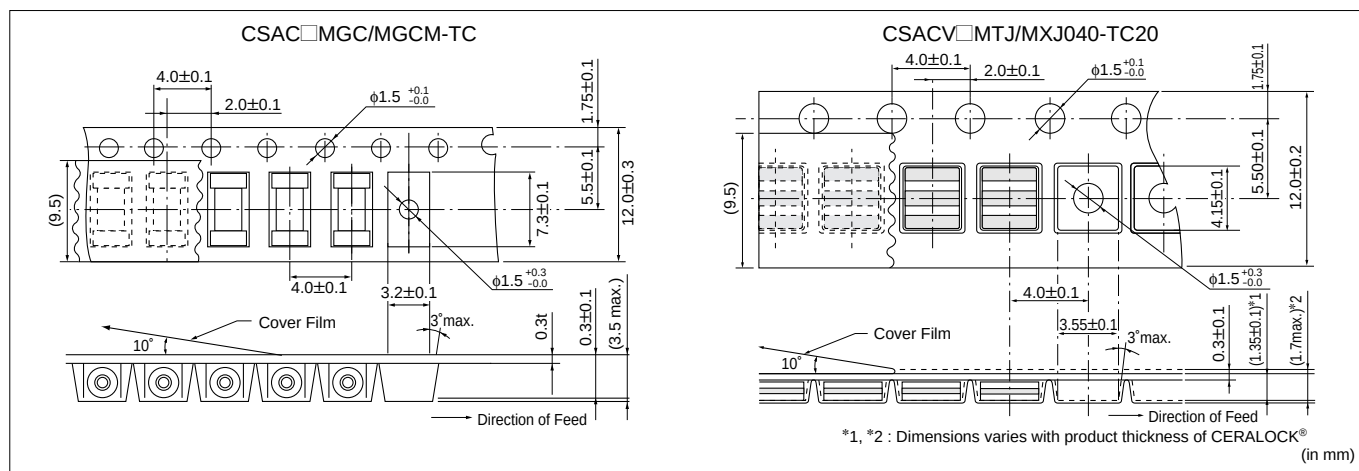


CERAMIC RESONATOR

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Chip Ceramic Resonator **CSAC/CSACV** Series

■ DIMENSIONS OF PLASTIC TAPE

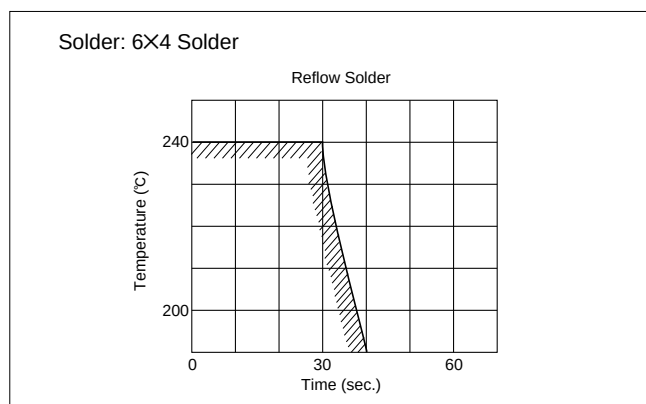


■ APPLICATIONS

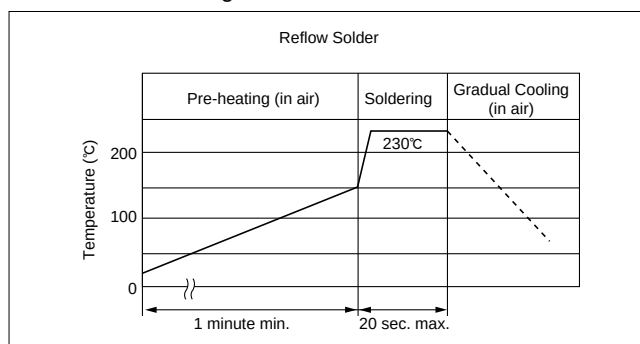
1. Soldering Conditions

● 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

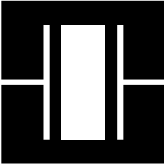


● Soldering Method

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.

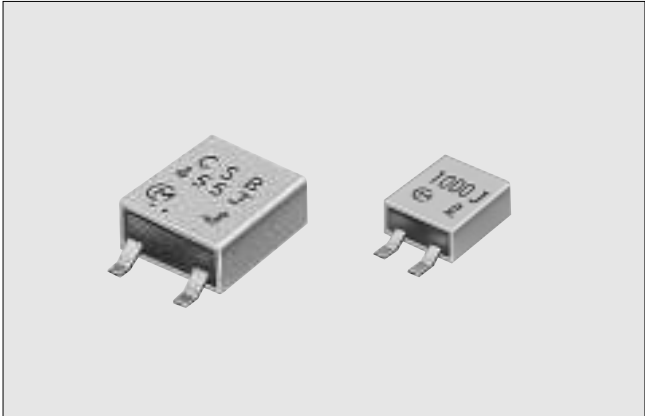
MURATA's original package technologies have enabled the development of the kHz band CERALOCK®. The series is perfect in miniature remote control units and A. V. modules.

■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

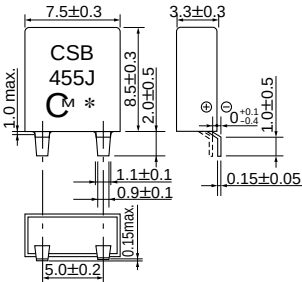
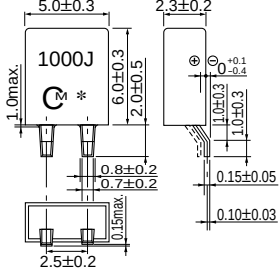
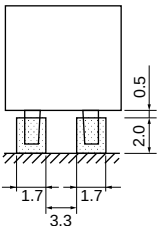
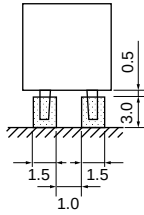
Item \ Type	CSBF Series	
	CSBF□J	CSBF□J
Frequency Range	430—519kHz	700—1250kHz
Oscillation Frequency Initial Tolerance	±0.5%	±0.5%
Oscillation Frequency Temperature Stability*1	±0.3%	±0.3%
Aging*2	±0.3%	±0.3%
Oscillation Frequency Measuring Circuit	IC :1/6CD4069UBEX2 V_{DD} :5V X :CERALOCK® C₁,C₂ :100pF R_d :5.6kΩ*3	

*1 At -20 to +80℃
*2 For 10 years at room temperature.
*3 This resistance value applies to the 700-1250 kHz range.

CERAMIC RESONATOR

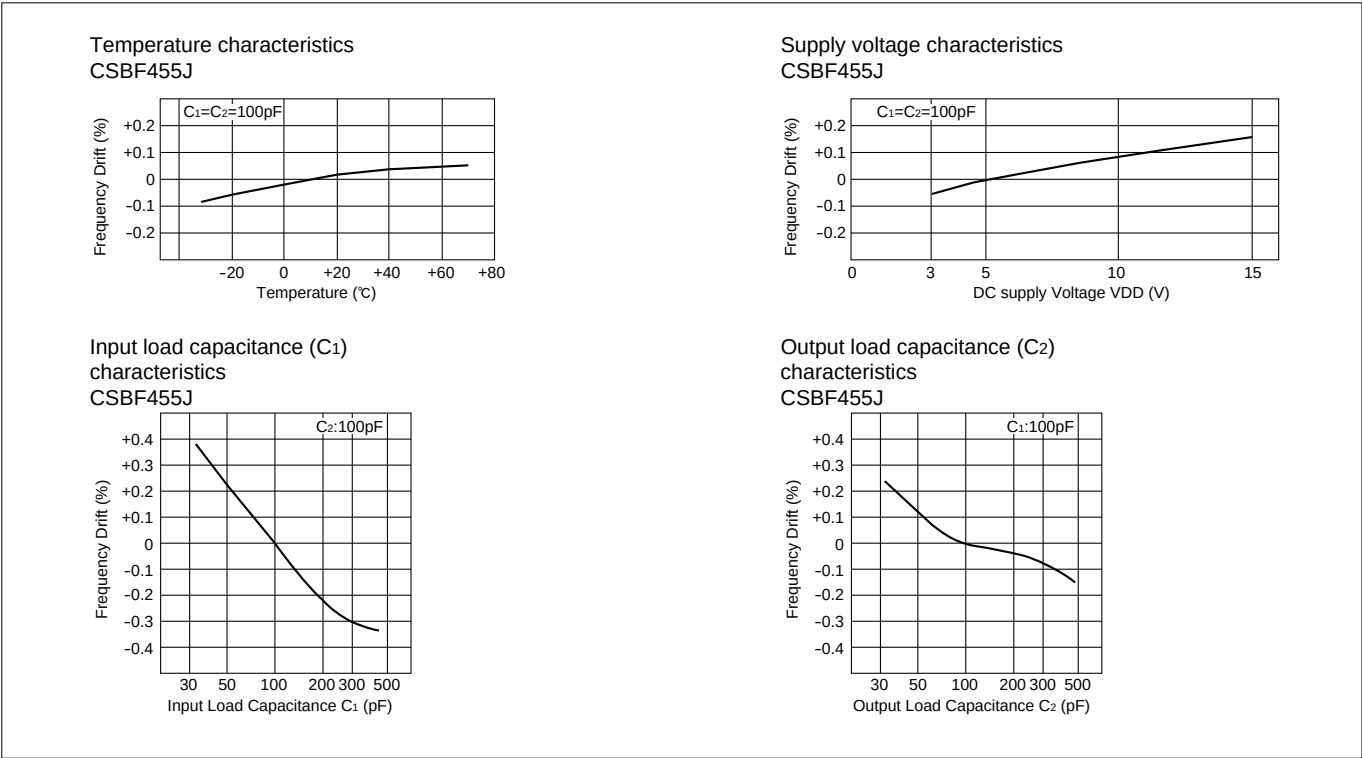
kHz Band SMD Ceramic Resonator **CSBF Series**

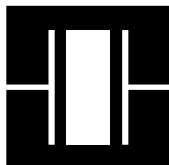
■DIMENSIONS/STANDARD LAND PATTERN (in mm)

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

*1 Available in several standard frequencies.

■TECHNICAL DATA



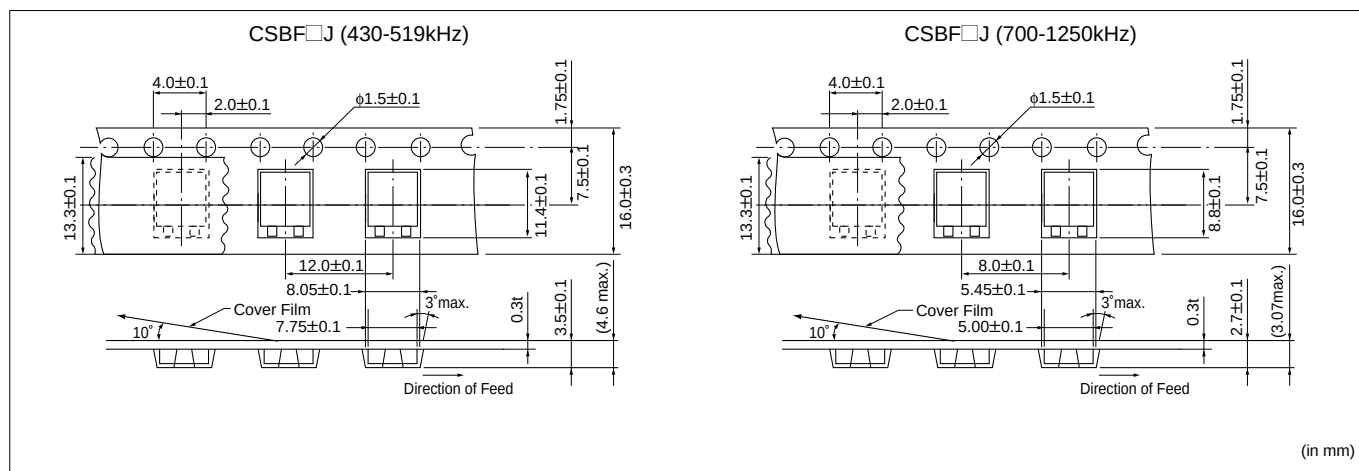


CERAMIC RESONATOR

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kHz Band SMD Ceramic Resonator **CSBF** Series

■ DIMENSIONS OF PLASTIC TAPE

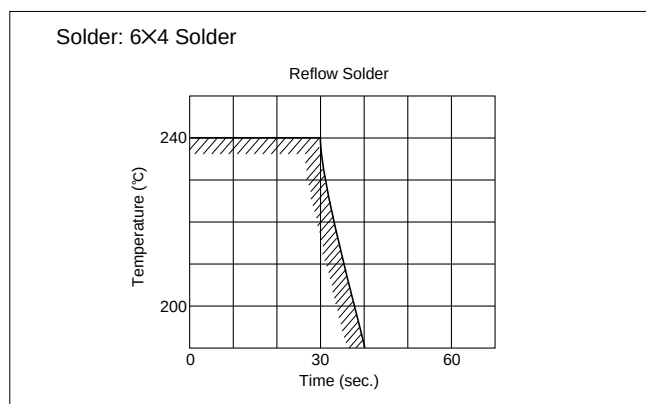


■ APPLICATIONS

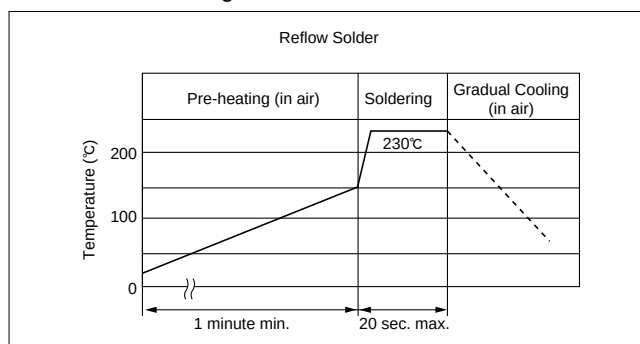
1. Soldering Conditions

● 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

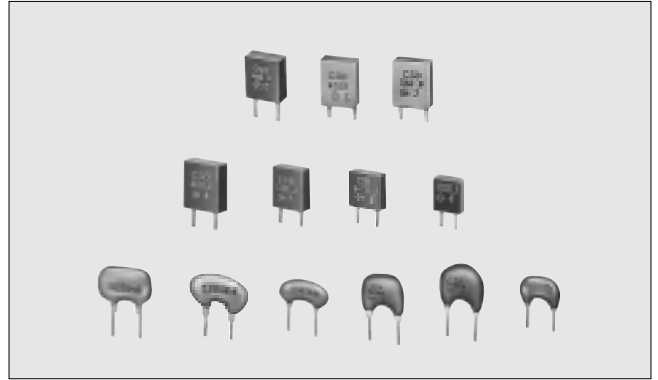
Ceramic Resonator **CSA/CSB** Series



CERALOCK[®] 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[®] 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.

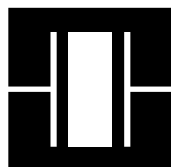


■FEATURES

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.)

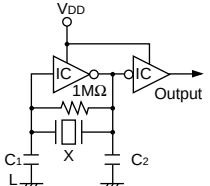
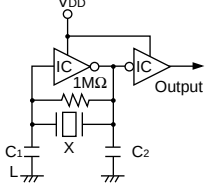
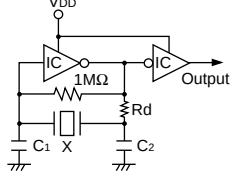


CERAMIC RESONATOR

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		 IC :1/6CD4069UBEX2 V_{DD} :5V (MTZ series:12V) X :CERALOCK® C₁,C₂ :30pF				 IC :1/6TC74HCU04X2 V_{DD} :5V X :CERALOCK® C₁,C₂ :30pF*5	 IC :1/6CD4069UBEX2 V_{DD} :5V X :CERALOCK® C₁,C₂ :Load Capacitors*3 R_d :5.6kΩ*4

*1 At -20 to +80°C

*2 For 10 years at room temperature.

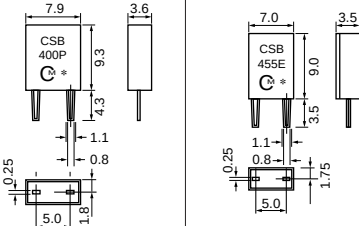
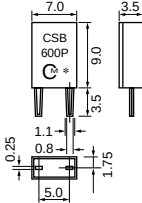
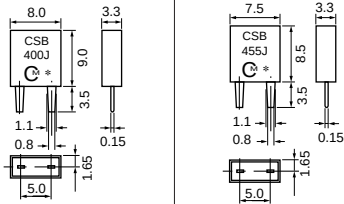
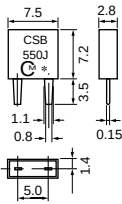
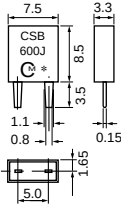
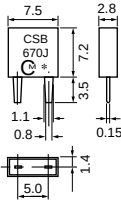
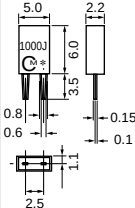
*3 Values vary according to frequency. Please contact us for details.

*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.

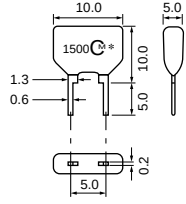
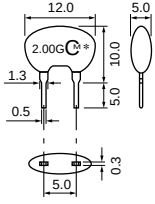
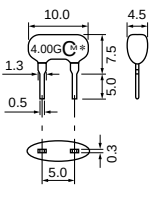
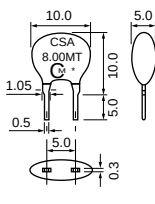
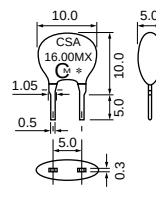
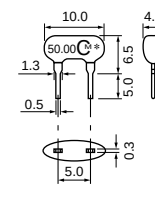
DIMENSIONS

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

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

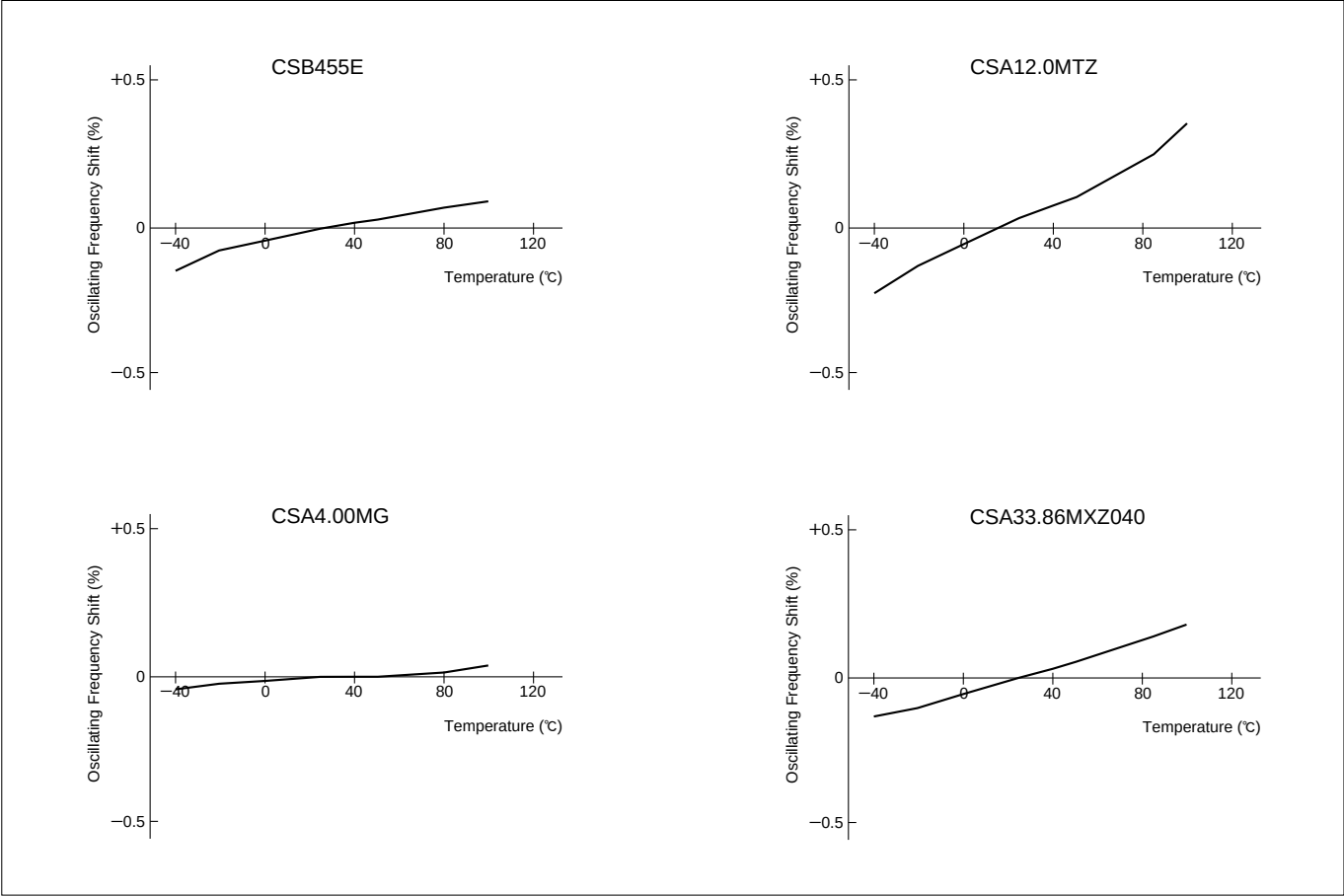
CERAMIC RESONATOR

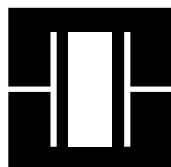
Ceramic Resonator **CSA/CSB** Series

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**

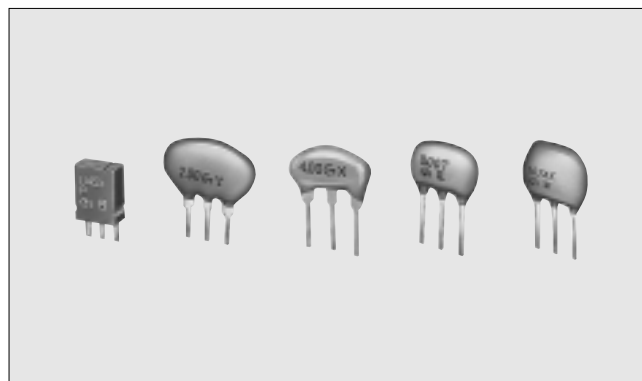
muRata

CERALOCK® with built in loading capacitors.

MURATA's ceramic resonator, CERALOCK®, 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	CSU Series	CST 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	IC :1/6CD4069UBEX2 V_{DD} :5V X :CERALOCK®				
	IC :1/6CD4069UBEX2*3 V_{DD} :5V (MTW series:12V) X :CERALOCK®				

*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.

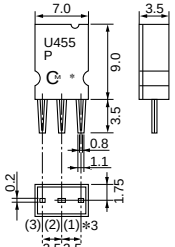
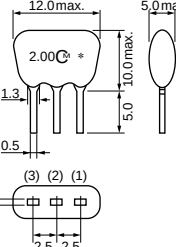
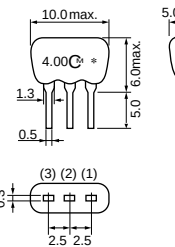
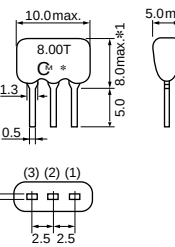
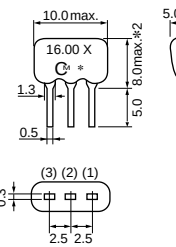
*4 Input terminal (1) should be connected to the input of an inverter.

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

CERAMIC RESONATOR

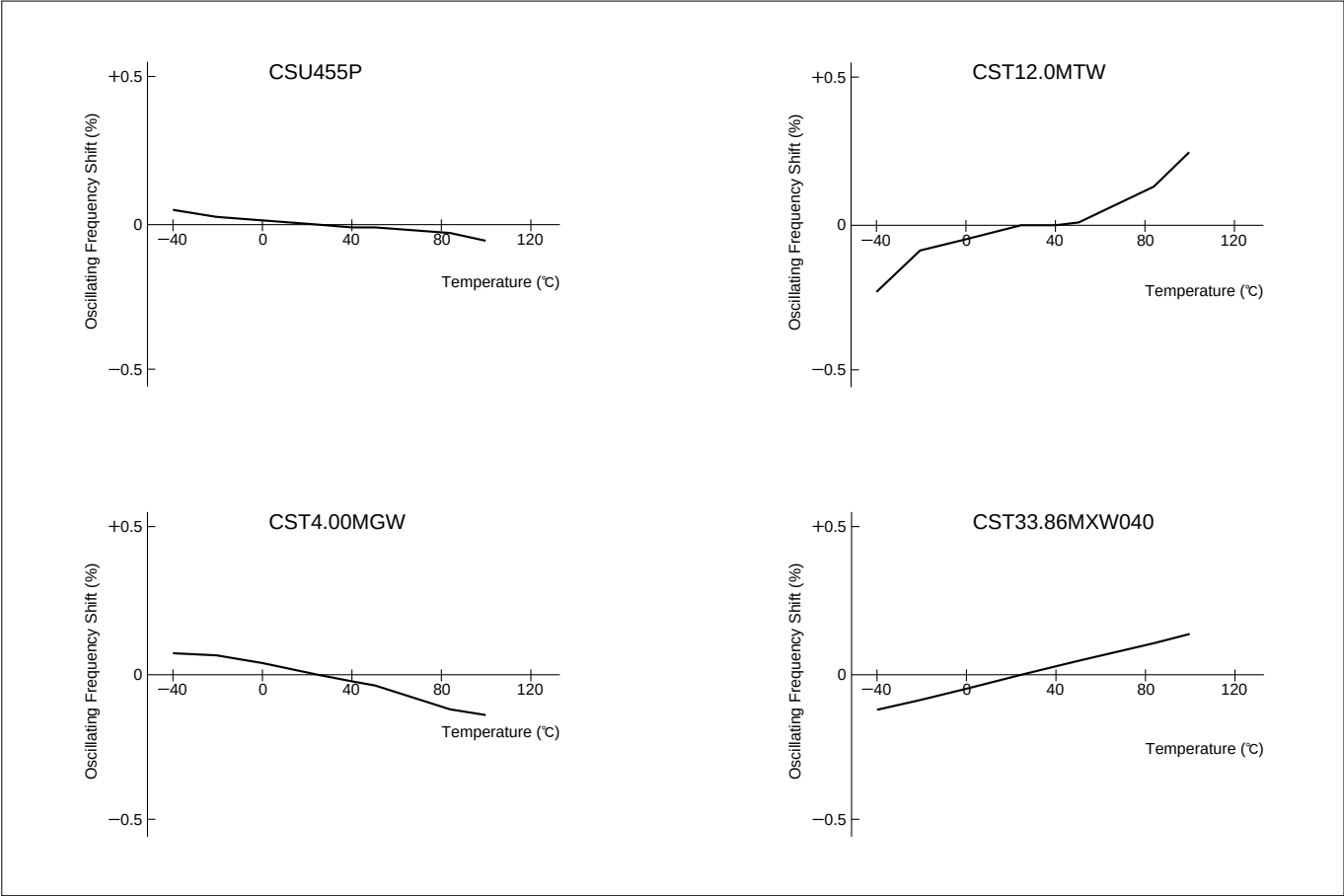
Ceramic Resonator **CSU/CST** Series

■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)					

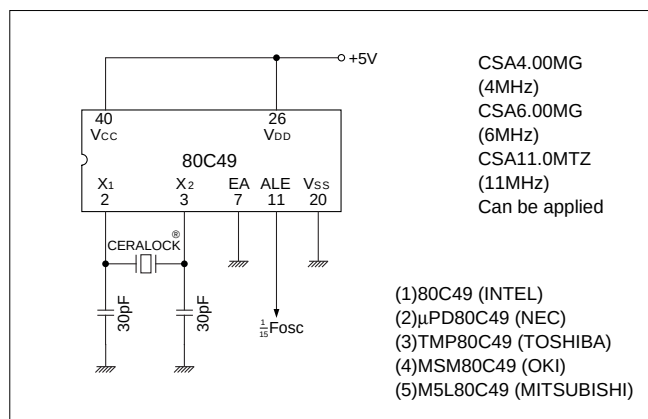
*1 6.31—7.99MHz: 9.0mm max.
*2 13.01—14.99MHz: 9.0mm max., 33.00—60.00MHz:7.0mm max.
*3 Terminals have directionality : (1) Input (2) Ground (3) Output
*4 The CSU□P is not washable.

■THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION

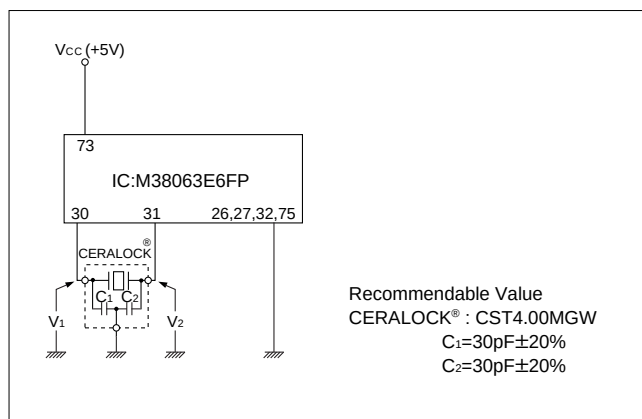


■APPLICATION CIRCUITS UTILIZING THE CERALOCK®

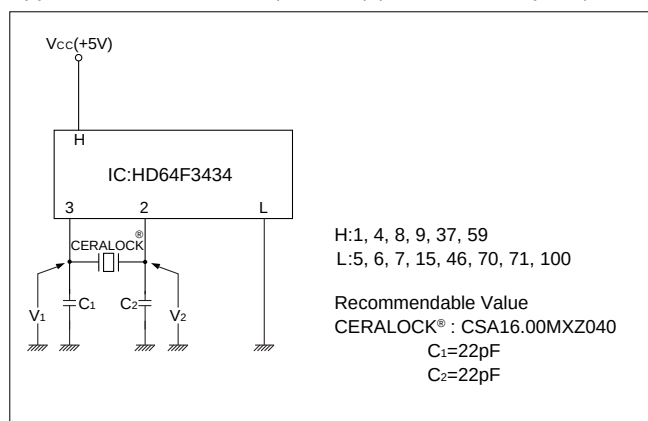
Application to 80C49 (8-bit Microcomputer)



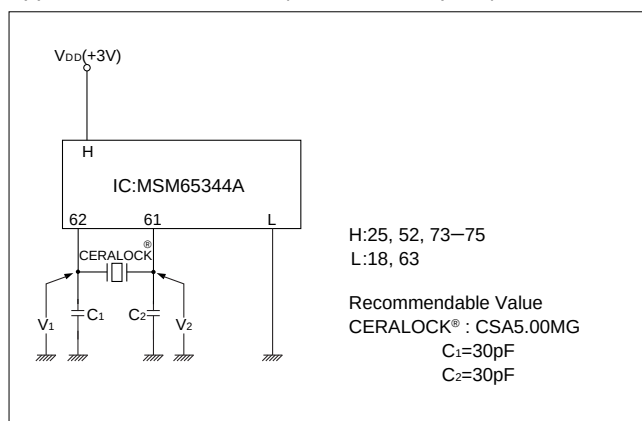
Application to M38063E6FP (MITSUBISHI) (8-bit Microcomputer)



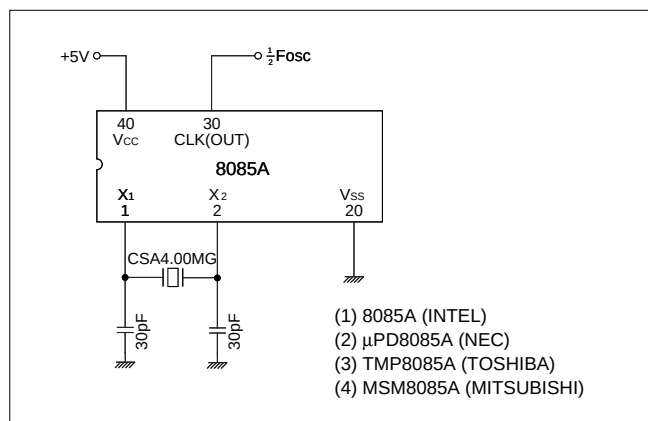
Application to HD64F3434 (HITACHI) (8-bit Microcomputer)



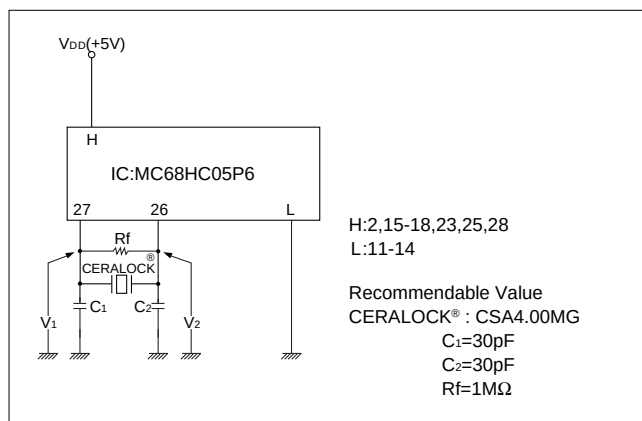
Application to MSM65344A (8-bit Microcomputer)



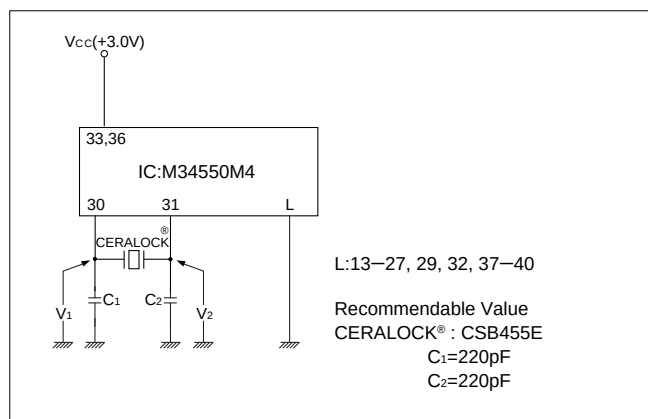
Application to 8085 (8-bit Microcomputer)



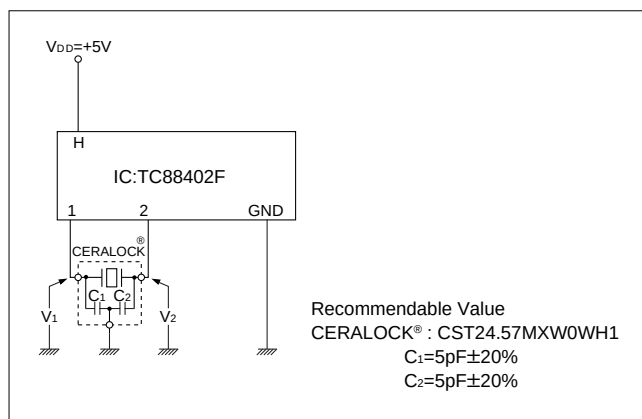
Application to MC68HC05P6 (MOTOROLA) (8-bit Microcomputer)

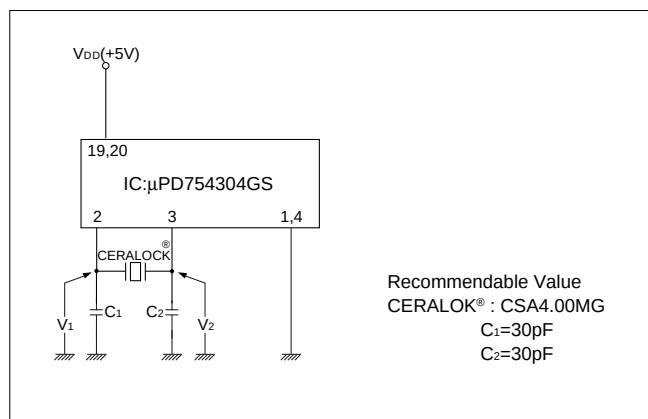


Application to M34550M4 (MITSUBISHI) (Remote Control Unit)

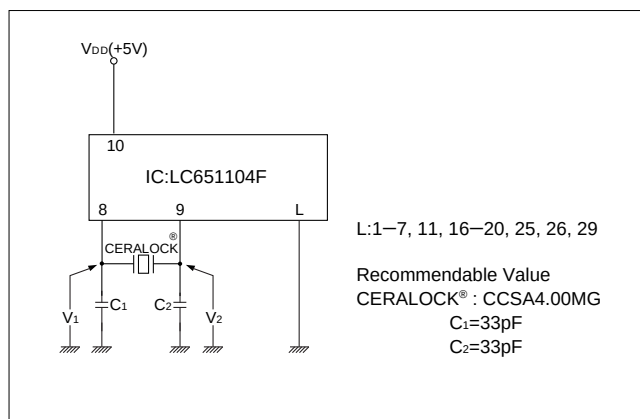


Application to TC88402F (TOSHIBA) (Speech Synthesizer)

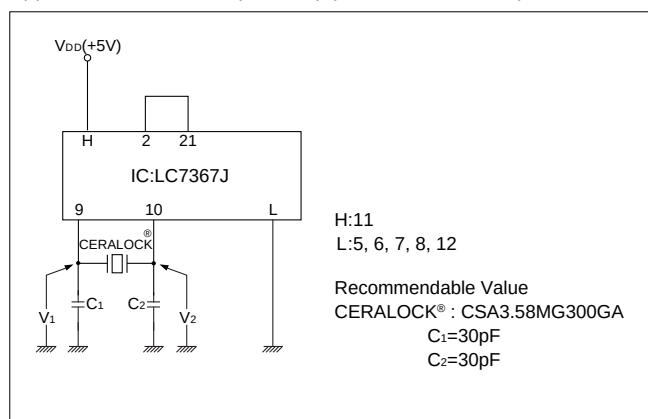


Application to μ PD754304GS (4-bit Microcomputer)

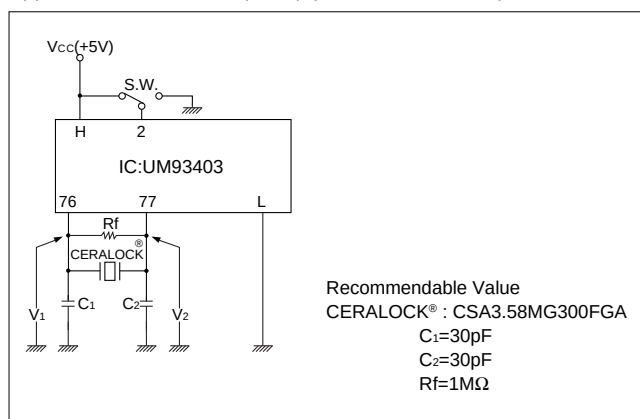
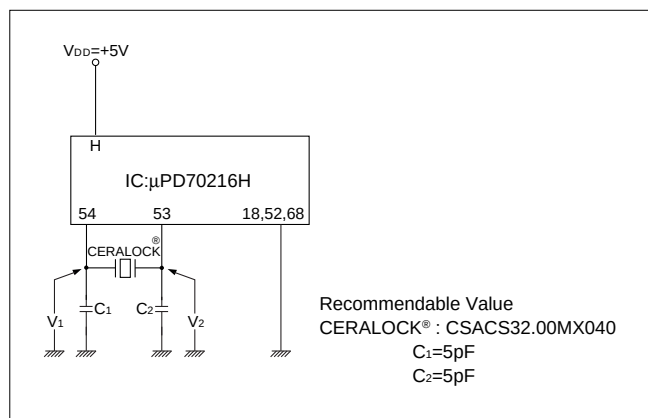
Application to 651104F (SANYO) (4-bit Microcomputer)



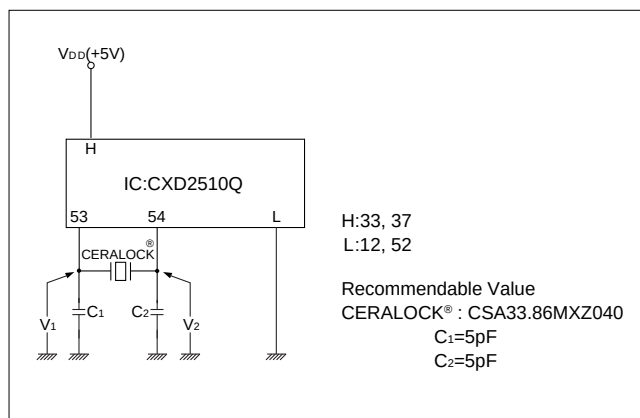
Application to LC7367J (SANYO) (Tone / Pulse Dialer)



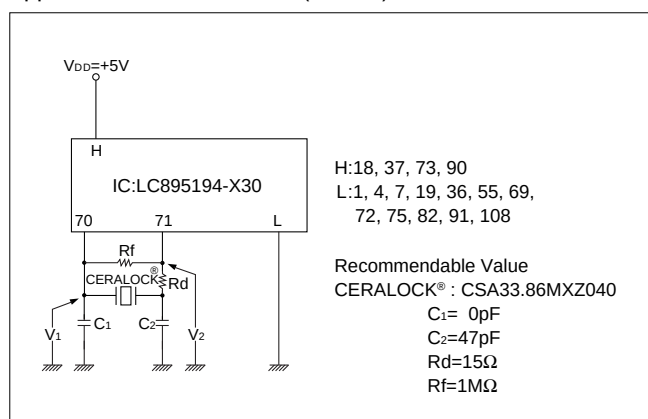
Application to UM93403 (UMC) (Tone / Pulse Dialer)

Application to μ PD70216H (NEC) (16-bit Microcomputer)

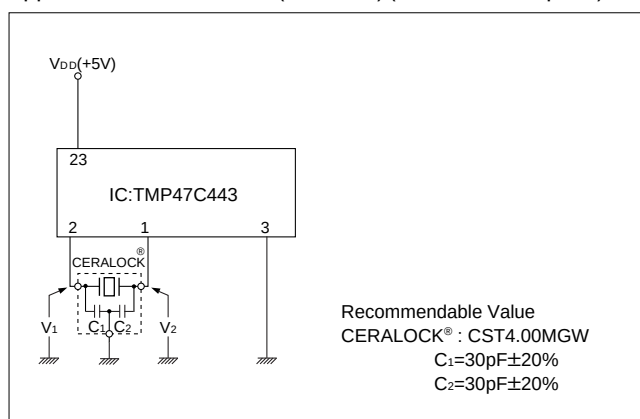
Application to CXD2510Q (SONY) (Digital Signal Processing IC for CD)



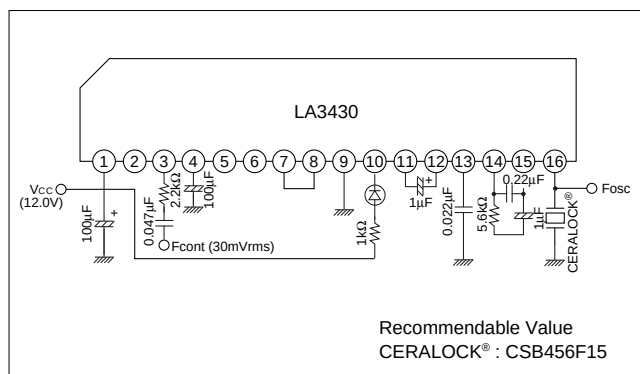
Application to LC895194-X30 (SANYO)



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



Application to LA3430 (SANYO) (FM Stereo MPX)

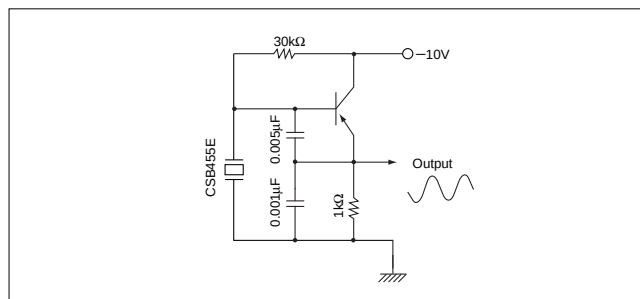
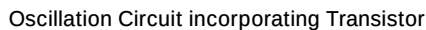


The diagram shows the LA7687 IC with the following connections and components:

- Vcc**: Pin 40 is connected to $V_{CC} = +7.8V$. A $0.01\mu F$ capacitor is connected between pins 40 and 44. A $100\mu F$ electrolytic capacitor is connected between pin 44 and ground.
- Pin 48**: Connected to ground.
- Pin 15**: Connected to ground.
- Pin 22**: Connected to ground.
- Pin 23**: Connected to ground through a CERALOCK® component.
- Pin 24**: Connected to a $22\mu F$ capacitor, which is then connected to ground. A $0.03\mu F$ capacitor is connected between pins 23 and 24.
- Pin 25**: Connected to ground through a 330Ω resistor.
- Vcont**: Pin 1 is connected to ground through a $1.8k\Omega$ resistor.
- HVcc 13mA**: Pin 2 is connected to ground through a $3.3\mu F$ capacitor.
- Hout (Fosc/32)**: Pin 3 is an output terminal.

IC: LA7687

Recommendable Value
CERALOCK®: CSB500F55

[illegible]

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Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

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- ① Aircraft equipment
- ② Aerospace equipment
- 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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