



CERAMIC RESONATOR (CERALOCK®)

CERAMIC RESONATOR (CERALOCK®)



*Innovator
in Electronics*

**Murata
Manufacturing Co., Ltd.**

Cat.No.P16E-11

■CONTENTS

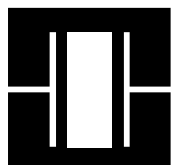
Types	Series	With Built-in Capacitors	Frequency Range	Page
Chip 3 Terminals	CSTCC□MG	○	2.00M—10.00MHz	1—3
	CSTCV□MTJ/MXJ, CSTCW□MX	○	10.01M—70.00MHz	1—3
Chip 2 Terminals	CSACV□MTJ/MXJ, CSACW□MX	—	10.01M—70.00MHz	4—6
SMD, kHz range	CSBF□J	—	430k—519kHz	7—9
			700k—1250kHz	7—9
2 Terminals, leaded	CSB□P/E/J/JR	—	375k—1250kHz	10—12
	CSA□MTZ/MXZ	—	10.01M—60.00MHz	10—12
3 Terminals, leaded	CST□MTW/MXW, CSTS□MG	○	2.00M—60.00MHz	13—14

Application Circuits

15—17

■NOTICE

- The component may be damaged if excess mechanical stress is applied.
- Please do not apply excess mechanical stress to the component and lead terminals at soldering.
- Conformal coating of the component is acceptable.
However, the resin material, curing temperature, and other process conditions should be evaluated to confirm stable electrical characteristics are maintained.
- 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 **CSTCC/CSTCV/CSTCW** 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

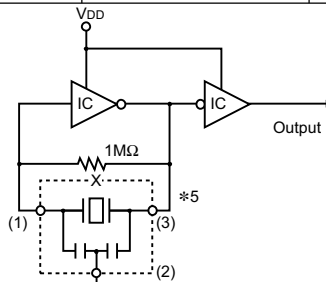
1. Oscillation circuits do not require external load capacitors.
2. The series is available in a wide frequency range.
3. The resonators are extremely small and have a low profile.
4. No adjustment is necessary for oscillation circuits.



■ APPLICATIONS

- Clock oscillators for microprocessors.
- Electronic control circuits for small electronic equipment such as hand held movie.
- Audio-visual applications (Camcorder, Remote Controller, etc.)
- Office automation equipments (DVD, CD-ROM, HDD, FDD, etc.)
- Automotive electronics (CSTCC□MGA series, CSTCV□MXA series)
- Dual Tone Multi Frequency (DTMF) generator for cordless telephones.

■ SPECIFICATIONS

Type	CSTCC Series	CSTCV Series		CSTCW Series	
Item	CSTCC□MG	CSTCV□MTJ	CSTCV□MXJ040	CSTCW□MX03	CSTCW□MX01
Frequency Range	2.00—10.00MHz* ¹	10.01—13.49MHz	13.50—20.00MHz	20.01—24.99MHz	25.00—70.00MHz
Oscillation Frequency Initial Tolerance	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Oscillation Frequency Temperature Stability* ²	±0.3%	±0.4%	±0.3%	±0.2%	±0.2%
Aging* ³	±0.3%	±0.3%	±0.3%	±0.1%	±0.1%
Oscillation Frequency Measuring Circuit	 <p>IC : 1/6CD4069UBEX2*⁴ V_{DD} :5V (MTJ series:12V) X :Chip CERALOCK®</p>				

*1 Available in several standard frequencies. (ex. 2.00, 2.45, 3.00, 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, MX03 and MX01 series (Except MX series 60.01-70.00MHz).

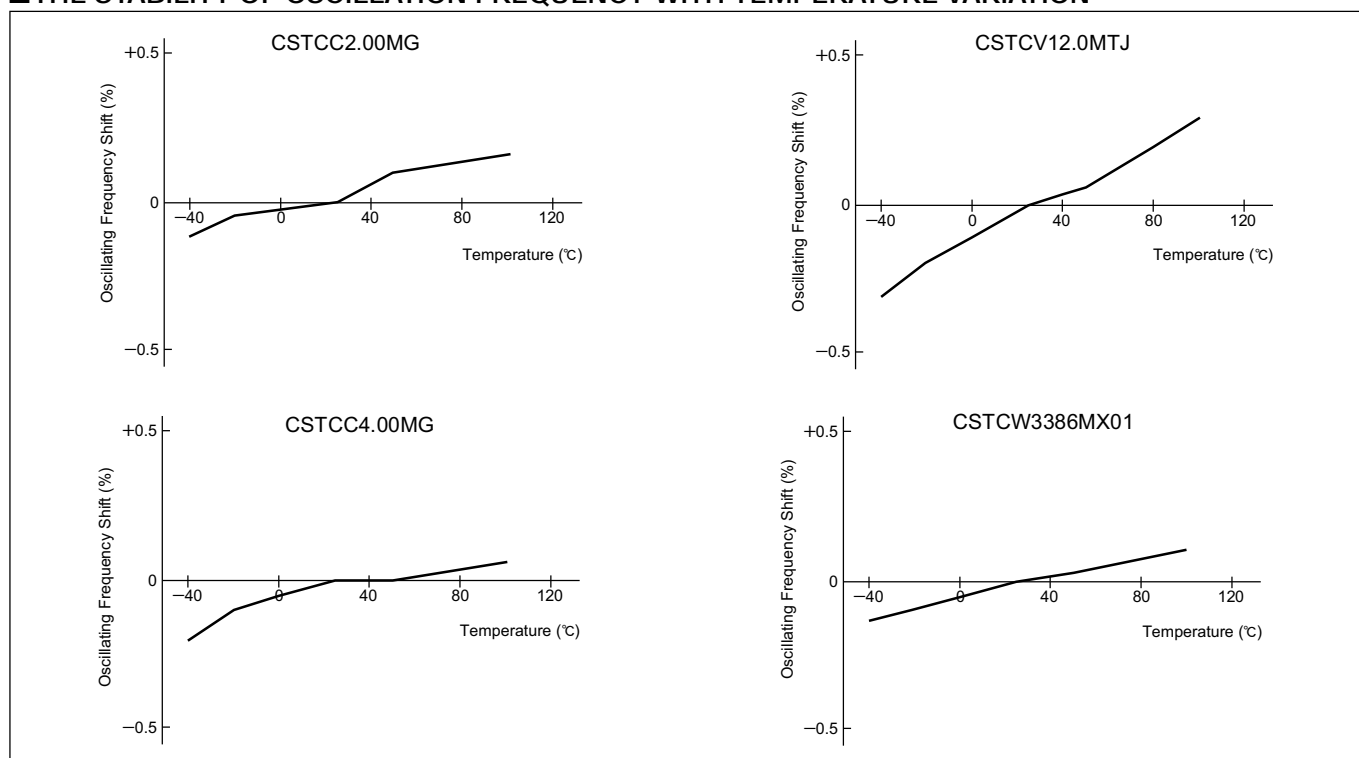
SN74AHC04 is used as the standard circuit for MX series (60.01-70.00MHz)

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

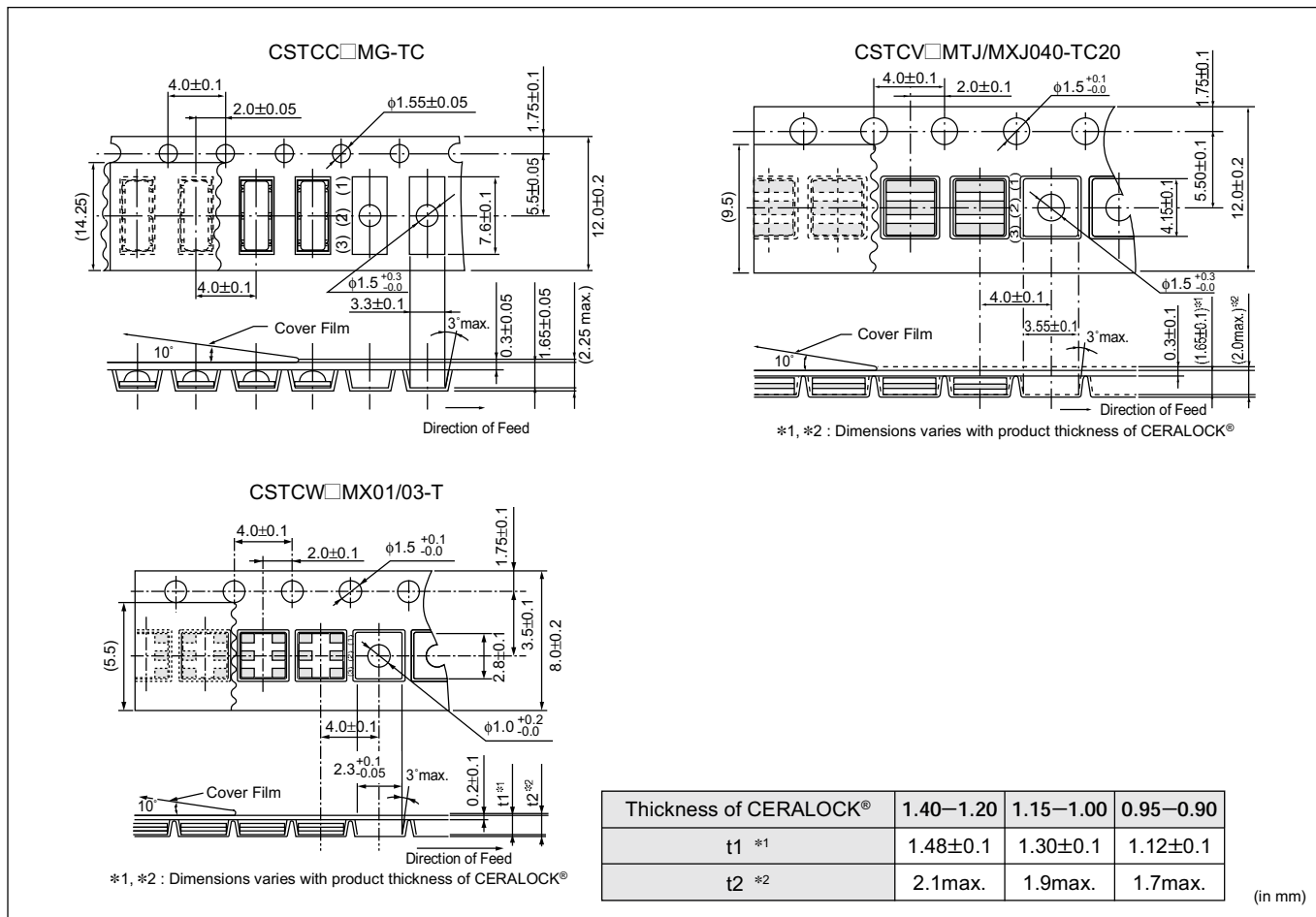
■DIMENSIONS/STANDARD LAND PATTERN (in mm tol.:±0.3mm)

Frequency	2.00—10.00MHz	10.01—13.49MHz	13.50—20.00MHz	20.01—70.00MHz
Type	CSTCC□MG	CSTCV□MTJ	CSTCV□MXJ040	CSTCW□MX01/03
Dimensions	<div><p>*1 1.75±0.05 under 2.99MHz</p></div>	<div><p>*2 Thickness varies with frequencies.</p><ul style="list-style-type: none">Land pattern and dimension of electrode that automotive use of CSTCV□MX is different from below Figure.</div>	<div><p>*3 Thickness varies with frequencies.</p></div>	
Standard Land Pattern	<div><p>Land Pattern electrode</p></div>	<div><p>1.5 1.5 3.1±0.2</p></div>	<div><p>Land 2.0±0.2</p></div>	

■THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



■DIMENSIONS OF PLASTIC TAPE

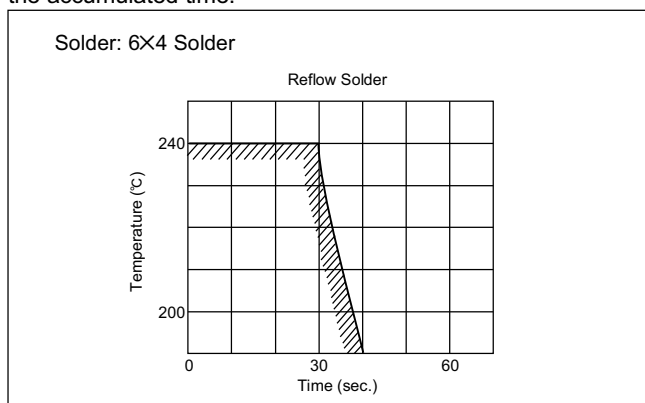


■APPLICATIONS

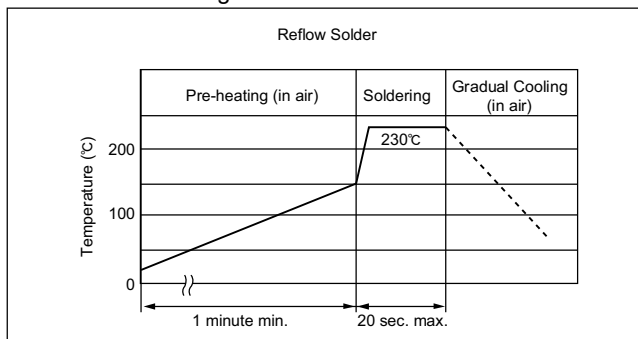
1. Soldering Conditions

● 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 **CSACV/CSACW** Series



Wide range of chip CERALOCK® is now available.

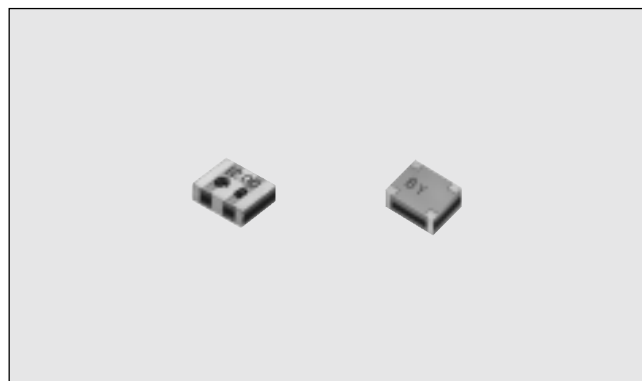
This diverse series owes its development to MURATA's package technology expertise and original mass production techniques. It enables high-density mounting and further miniaturization of electronic equipment.

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

- Clock oscillators for microprocessors.
- Electronic control circuits for small electronic equipment.
- Automotive electronics (CSACV□MXA series)



SPECIFICATIONS

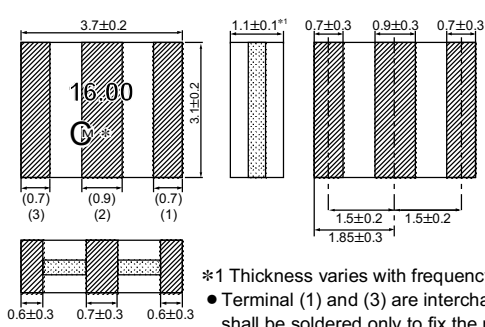
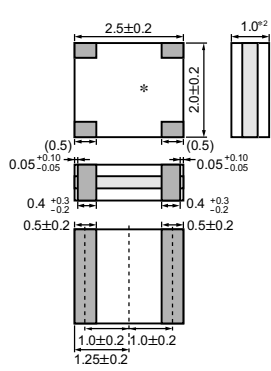
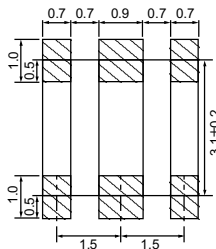
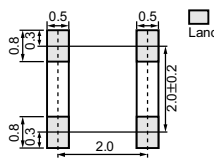
Type Item	CSACV Series		CSACW Series	
	CSACV□MTJ	CSACV□MXJ040	CSACW□MX03	CSACW□MX01
Frequency Range	10.01–13.49MHz	13.50–20.00MHz	20.01–24.99MHz	25.00–70.00MHz
Oscillation Frequency Initial Tolerance	±0.5%	±0.5%	±0.5%	±0.5%
Oscillation Frequency Temperature Stability*1	±0.5%	±0.3%	±0.2%	±0.2%
Aging*2	±0.5%	±0.3%	±0.1%	±0.1%
Oscillation Frequency Measuring Circuit	<p>IC : 1/6CD4069UBEX2*3 V_{DD} : 5V (MTJ series: 12V) X : Chip CERALOCK®</p>			

*1 At -20 to +80°C

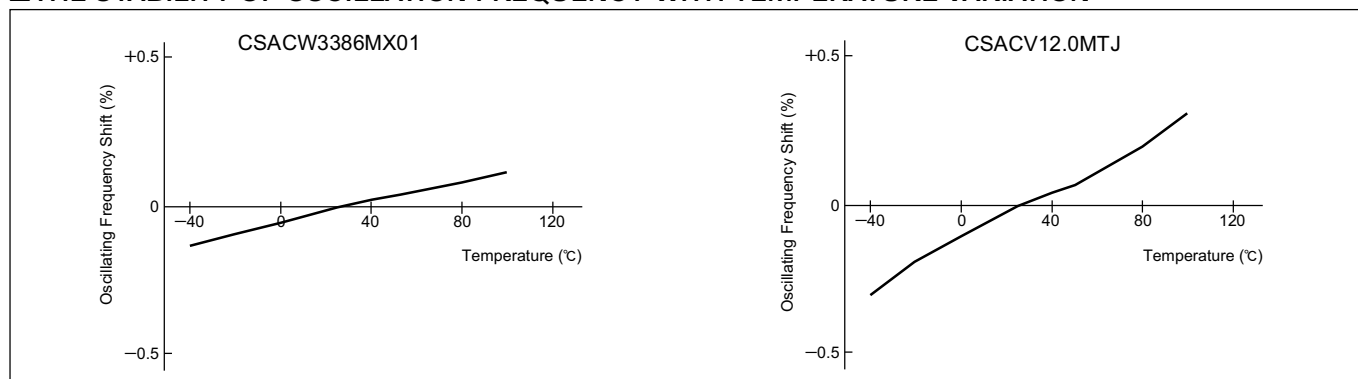
*2 For 10 years at room temperature

*3 TC74HCU04 is used as the standard circuit for the MXJ040, MX03 and MX01 series (Except MX series 60.01-70.00MHz).
SN74AHC04 is used as the standard circuit for MX series (60.01-70.00MHz).

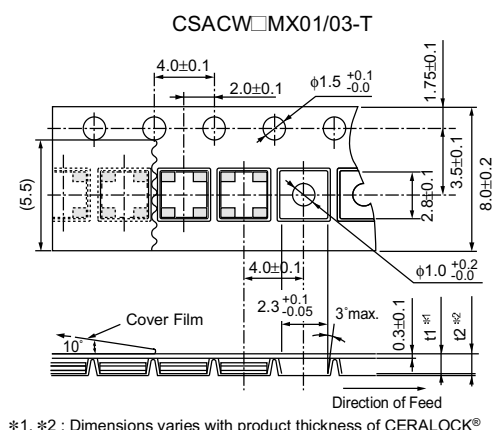
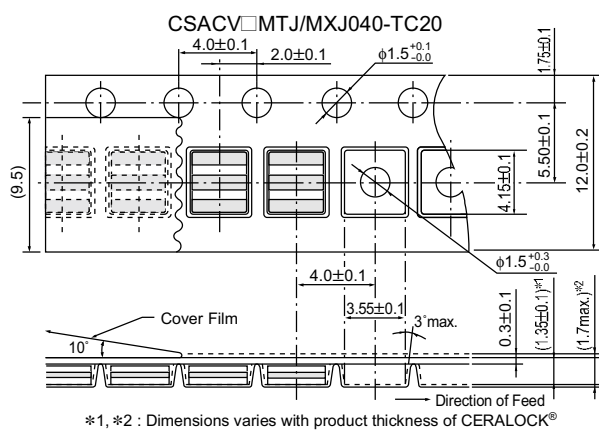
DIMENSIONS/STANDARD LAND PATTERN (in mm)

Frequency	10.01–13.49MHz	13.50–20.00MHz	20.01–70.00MHz
Type	CSACV□MTJ	CSACV□MXJ040	CSACW□MX01/03
Dimensions	 <p>*1 Thickness varies with frequency.</p> <ul style="list-style-type: none"> 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. Land pattern and dimension of electrode that automotive use of CSTCV□MX is different from Figure below. 		 <p>*2 Thickness varies with frequency.</p>
Standard Land Pattern			

THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION



■ DIMENSIONS OF PLASTIC TAPE



Thickness of CERALOCK®	1.40—1.20	1.15—1.00	0.95—0.90
t1 *1	1.48±0.1	1.30±0.1	1.12±0.1
t2 *2	2.1max.	1.9max.	1.7max.

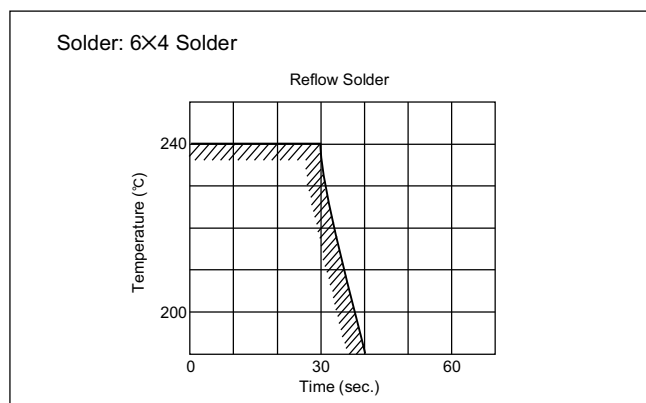
■ APPLICATIONS

1. Soldering Conditions

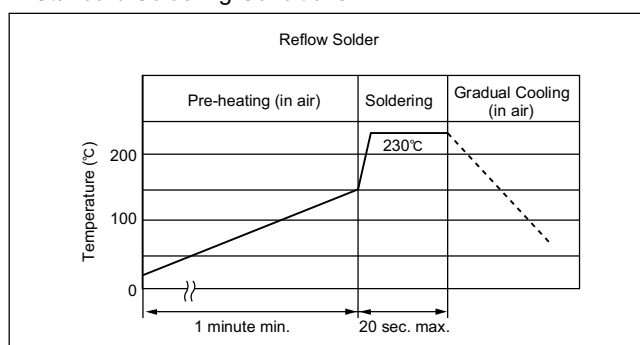
● Soldering Temperature and Time

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

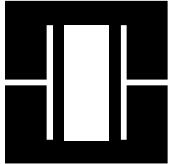


● Soldering Method

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.

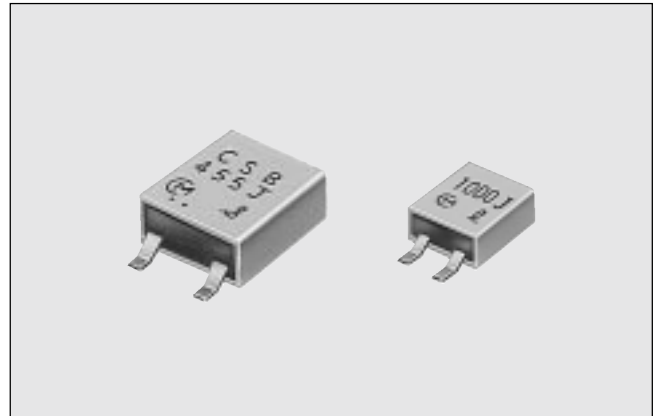
MURATA's original package technologies have enabled the development of the kHz band CERALOCK®. The series is perfect in miniature remote control units and AV modules.

FEATURES

1. The series withstands reflow soldering.
2. The series is mountable by automatic placers.
3. No adjustment is necessary for oscillation circuits.

APPLICATIONS

- Clock oscillators for microprocessors.
- OA equipment
- AV modules



SPECIFICATIONS

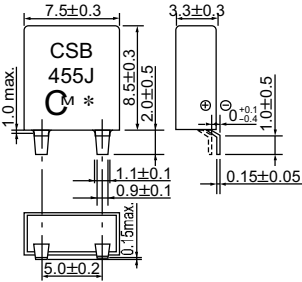
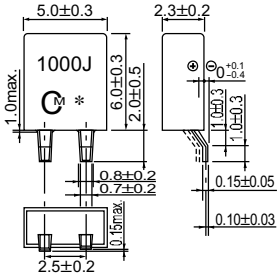
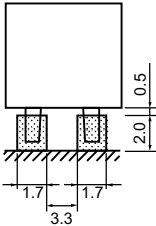
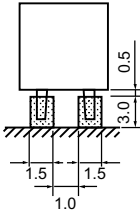
Item \ Type	CSBF Series	
	CSBF□J	CSBF□J
Frequency Range	430–519kHz	700–1250kHz
Oscillation Frequency Initial Tolerance	±0.5%	±0.5%
Oscillation Frequency Temperature Stability*1	±0.3%	±0.3%
Aging*2	±0.3%	±0.3%
Oscillation Frequency Measuring Circuit	<div style="margin-top: 10px;"> IC : 1/6CD4069UBEX2 V_{DD} : 5V X : CERALOCK® C₁, C₂ : 100pF R_d : 5.6kΩ*3 </div>	

*1 At -20 to +80°C.

*2 For 10 years at room temperature.

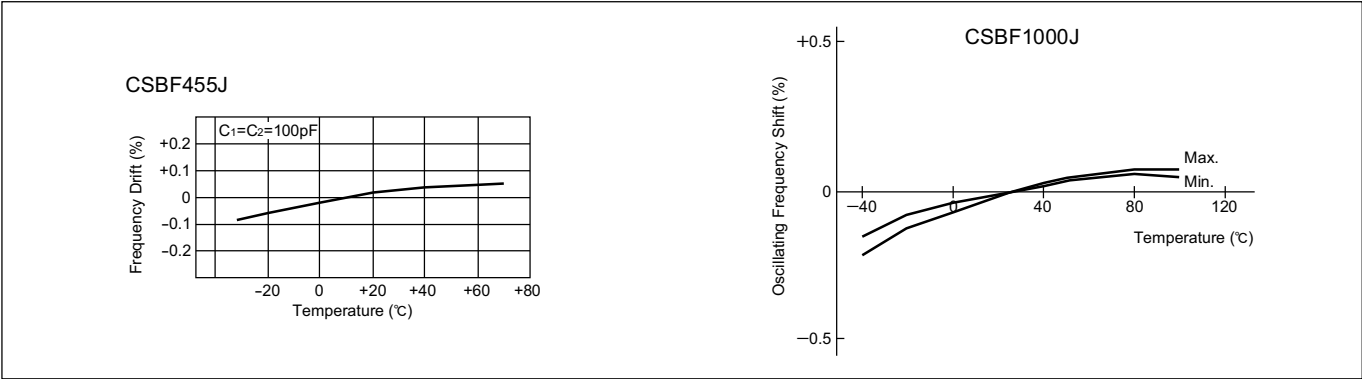
*3 This resistance value applies to the 700-1250 kHz range.

■DIMENSIONS/STANDARD LAND PATTERN (in mm)

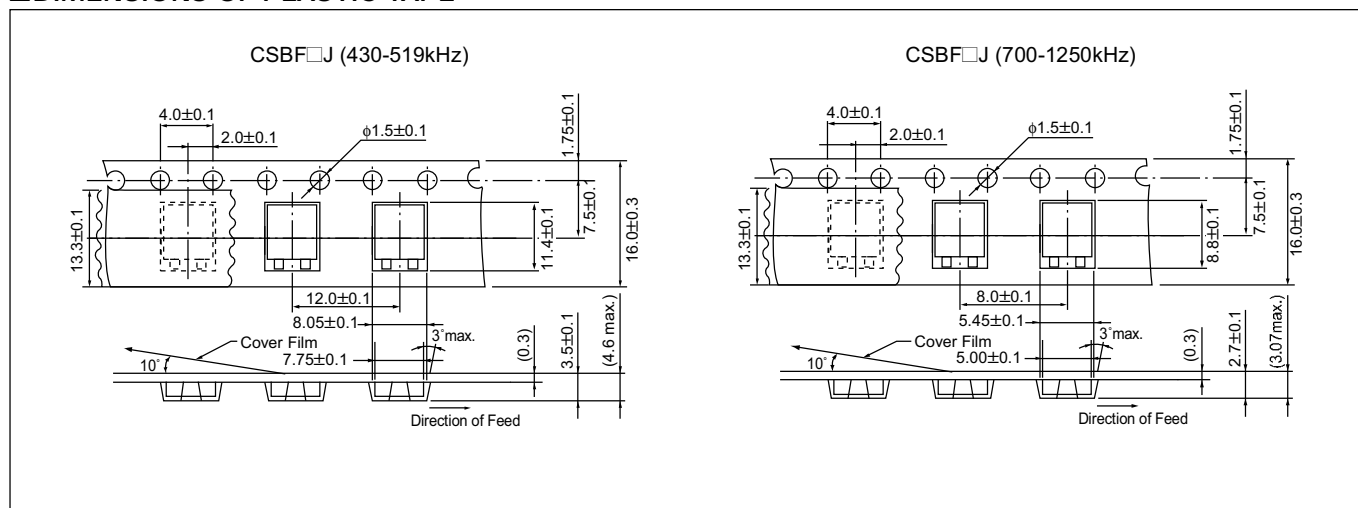
Frequency	430—519kHz	700—1250kHz
Type	CSBF□J	CSBF□J*1
Dimensions		
Standard Land Pattern		

*1 Available in several standard frequencies.

■TECHNICAL DATA (Temperature characteristics)



■ DIMENSIONS OF PLASTIC TAPE



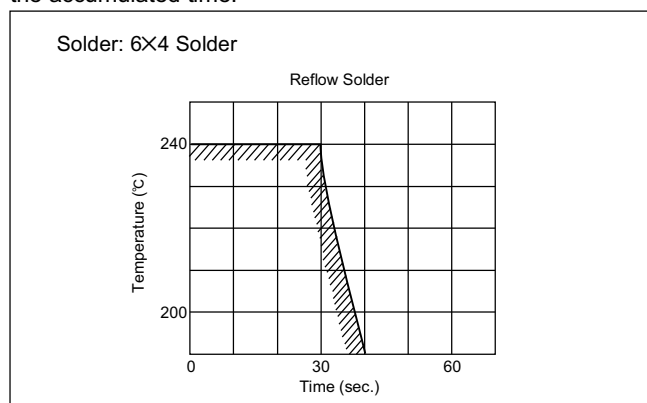
■ APPLICATIONS

1. Soldering Conditions

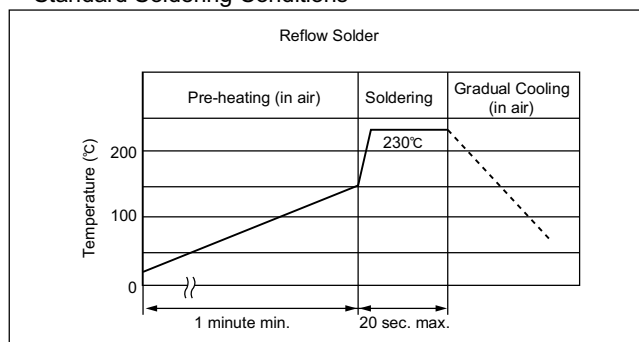
● Soldering Temperature and Time

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



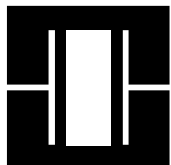
● Soldering Method

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

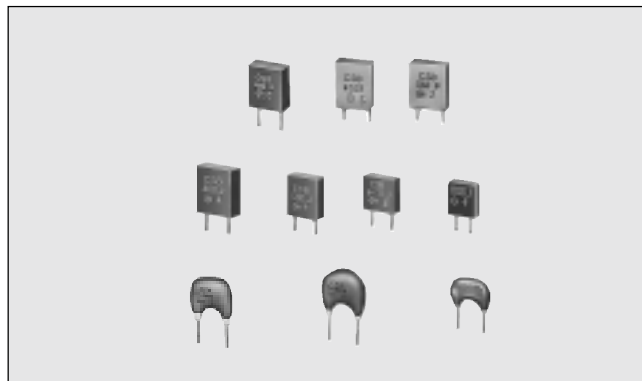
Ceramic Resonator **CSA/CSB Series**



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.



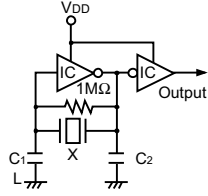
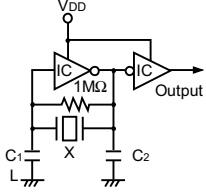
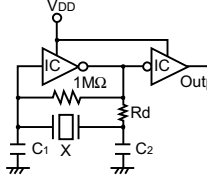
■FEATURES

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

- Square-wave and sine-wave oscillator.
- Clock generator for microprocessors.
- Tone Dialers and Pulse Dialers for telephone.
- Remote control systems.
- Automotive electronics (engine control, digital speed meters, etc.) (Suffixed "A". ex. CSB□JA)

SPECIFICATIONS

Item	Type	CSA Series		CSB Series	
		CSA□MTZ	CSA□MXZ040	No Washable	Washable
Frequency Range		10.01–13.00MHz	13.01–60.00MHz	375–699kHz	375–1250kHz
Oscillation Frequency Initial Tolerance		$\pm 0.5\%$		$\pm 2\text{kHz}$	$\pm 0.5\text{kHz}$
Oscillation Frequency Temperature Stability*1		$\pm 0.5\%$	$\pm 0.3\%$	$\pm 0.3\%$	
Aging*2		$\pm 0.5\%$	$\pm 0.3\%$	$\pm 0.5\%$	
Oscillation Frequency Measuring Circuit		 <p>IC :1/6CD4069UBEX2 V_{DD} :12V X :CERALOCK® C₁,C₂ :30pF</p>	 <p>IC :1/6TC74HCU04X2 V_{DD} :5V X :CERALOCK® C₁,C₂ :30pF*5</p>	 <p>IC :1/6CD4069UBEX2 V_{DD} :5V X :CERALOCK® C₁,C₂ :Load Capacitors*3 Rd :5.6kΩ*4</p>	

*1 At -20 to +80°C

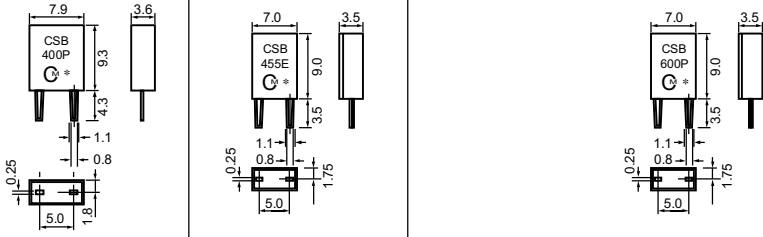
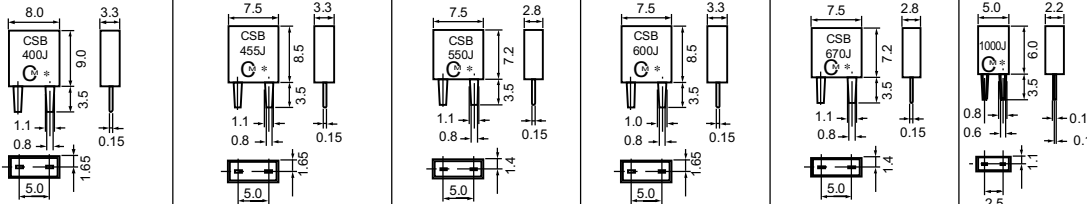
*2 For 10 years at room temperature.

*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.

DIMENSIONS

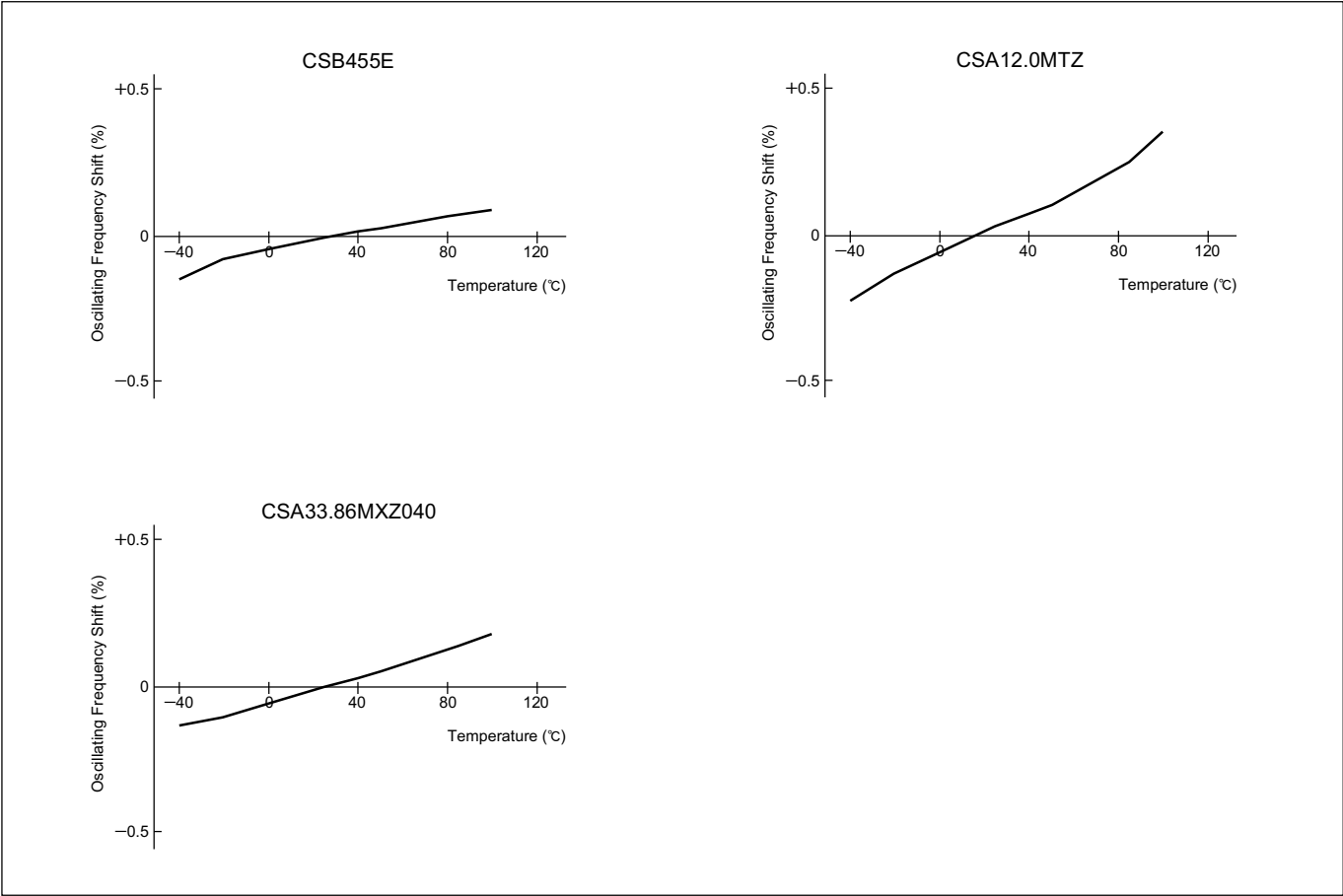
Standard Products		DIMENSIONS					
		Not Washable					
Washable	Frequency	375—429kHz	430—509kHz	510—699kHz			—
	Part Number	CSB□P	CSB□E	CSB□P			—
	Dimensions (in mm)						
	Frequency	375—429kHz	430—519kHz	520—575kHz	576—655kHz	656—699kHz	700—1250kHz
	Part Number	CSB□J	CSB□J	CSB□J	CSB□JR	CSB□J	CSB□J
	Ultrasonic Cleaning*6	ALLOWED*6	ALLOWED*6	ALLOWED*7	ALLOWED*6	ALLOWED*6	ALLOWED*6
	Dimensions (in mm)						

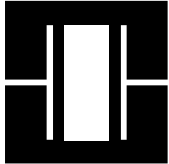
*6 Please consult MURATA regarding ultrasonic cleaning conditions to avoid possible damage during ultrasonic cleaning.

■DIMENSIONS

Frequency	10.01—13.00MHz	13.01—32.99MHz	33.00—60.00MHz
Part Number	CSA□MTZ	CSA□MXZ	CSA□MXZ
Oscillation Mode	Thickness Longitudinal Vibration	Thickness Longitudinal Vibration (3rd OVERTONE)	Thickness Longitudinal Vibration (3rd OVERTONE)
Dimensions (in mm)			

■THE STABILITY OF OSCILLATION FREQUENCY WITH TEMPERATURE VARIATION





CERAMIC RESONATOR

Ceramic Resonator **CST/CSTS** Series

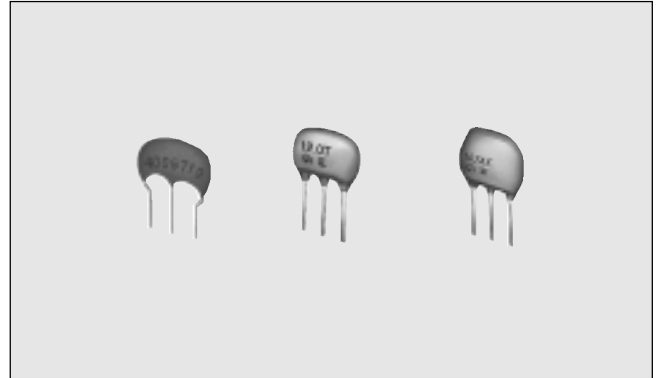


CERALOCK® with built in loading capacitors.

MURATA's ceramic resonator, CERALOCK®, has been widely applied as the most suitable component for clock oscillators in a broad range of microprocessors. The CSTS series (MHz 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

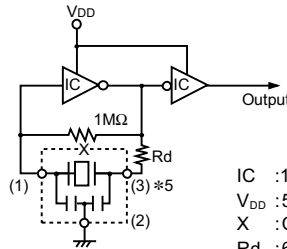
1. Oscillation circuits do not require external load capacitors.
2. The series is stable over a wide temperature range.
3. The resonators are compact, light weight and exhibit superior shock resistance performance.
4. They enable the design of oscillator circuits requiring no adjustment.
5. The series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



■APPLICATIONS

- DTMF generators
- Remote control units
- Clock oscillators for microcomputers
- Automated office equipment
- Automotive electronics (Suffixed "A" ex. CSTS-MGA)

■SPECIFICATIONS

Type Item	CSTS Series	CST Series	
	CSTS□MG03/06	CST□MTW	CST□MXW040
Frequency Range	2.00—10.00MHz	10.01—13.00MHz	13.01—60.00MHz
Oscillation Frequency Initial Tolerance	±0.5%	±0.5%	±0.5%
Oscillation Frequency Temperature Stability*1	±0.2%	±0.4%	±0.3%
Aging*2	±0.2%	±0.3%	±0.3%
Oscillation Frequency Test Circuit	 <p>IC :1/6CD4069UBEX2*3 V_{DD} :5V (MTW series:12V) X :CERALOCK® R_d :680Ω*4</p>		

*1 At -20 to +80°C (Temperature Condition). This value varies for built-in capacitance of the CSTS series.

*2 For 10years at room temperature .

*3 TC74HCU04 is used as the standard circuit for the MXW040 series. TC4069UBE is used as the standard circuit for the CSTS□MG03 series.

*4 This resistance value applies to the CSTS□MG06 series.

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

[illegible]

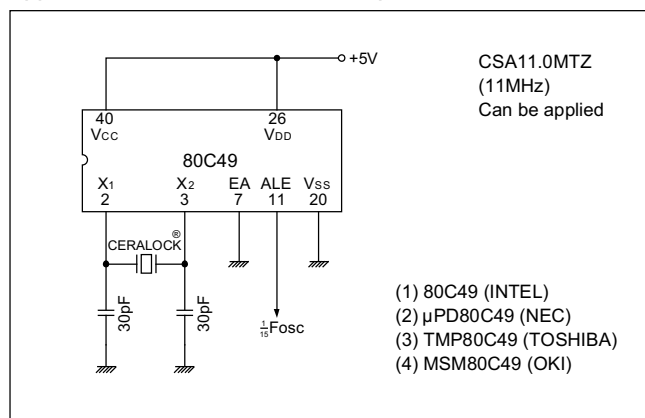
*3 13.01—14.99MHz: 9.0mm max., 33.00—60.00MHz:7.0mm max.

The figure consists of three separate line graphs, each showing the relationship between Oscillating Frequency Shift (%) on the y-axis and Temperature (°C) on the x-axis. The y-axis for all graphs ranges from -0.5 to +0.5 with major ticks at -0.5, 0, and +0.5. The x-axis for all graphs ranges from -40 to 120 with major ticks at -40, 0, 40, 80, and 120.

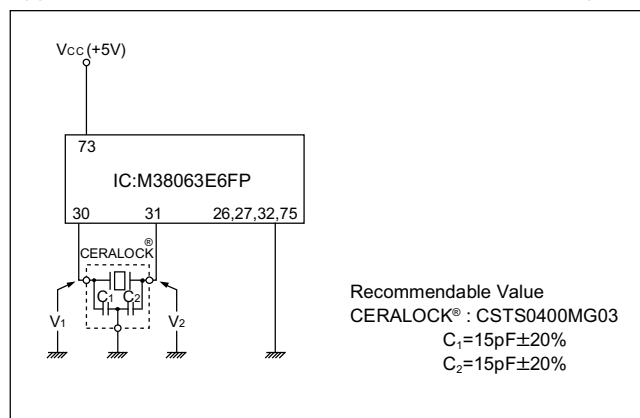
- Top Left Graph (CST12.0MTW):** The frequency shift is approximately -0.25% at -40°C, rises to 0% at 0°C, remains at 0% until 40°C, and then increases to approximately +0.25% at 100°C.
- Top Right Graph (CSTS0400MG03):** The frequency shift is approximately -0.05% at -40°C, rises to a peak of approximately +0.05% at -20°C, then decreases to 0% at 40°C, and continues to decrease to approximately -0.2% at 100°C. Two lines are plotted, labeled 'Max.' and 'Min.', which are very close to each other.
- Bottom Left Graph (CST33.86MXW040):** The frequency shift is approximately -0.15% at -40°C and increases linearly to approximately +0.15% at 100°C.

■APPLICATION CIRCUITS UTILIZING THE CERALOCK®

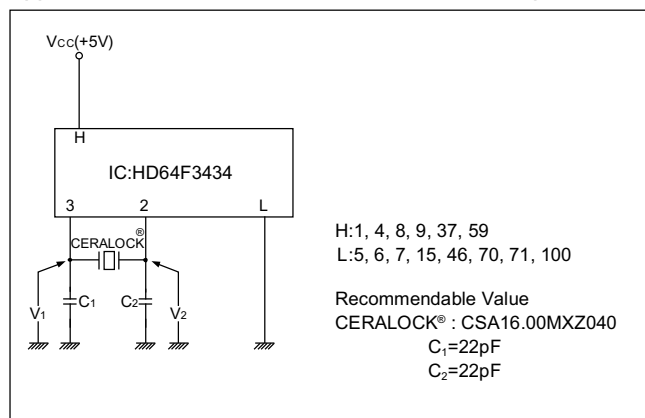
Application to 80C49 (8-bit Microcomputer)



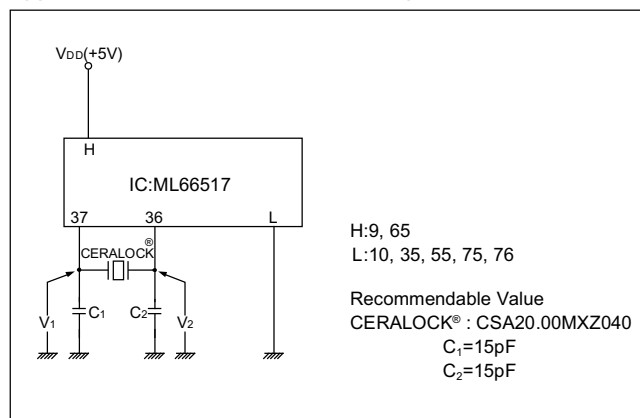
Application to M38063E6FP (MITSUBISHI) (8-bit Microcomputer)



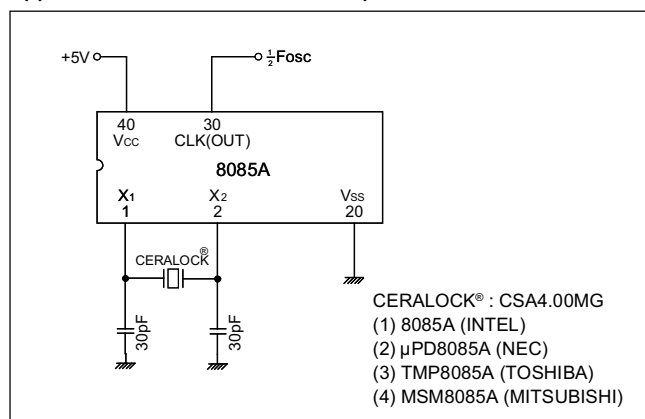
Application to HD64F3434 (HITACHI) (8-bit Microcomputer)



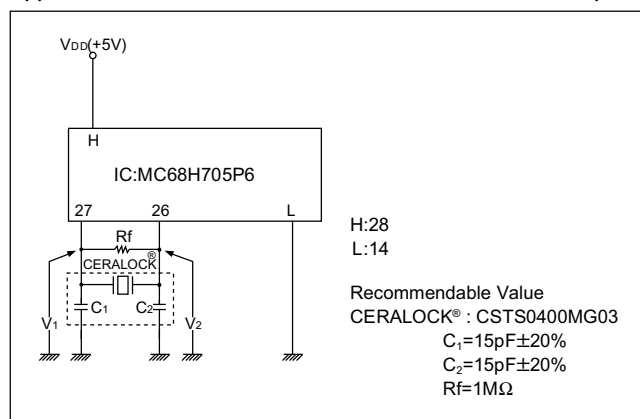
Application to ML66517 (8-bit Microcomputer)



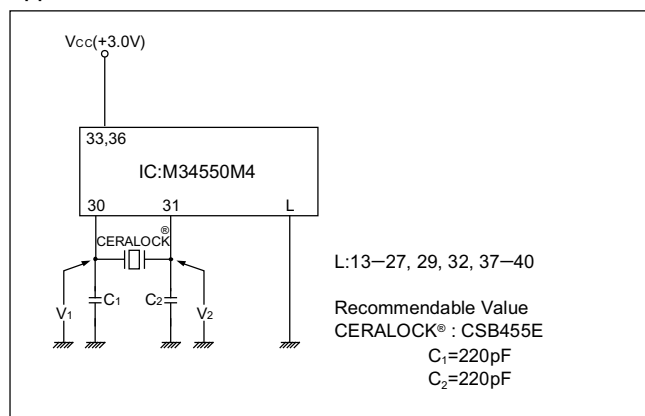
Application to 8085 (8-bit Microcomputer)



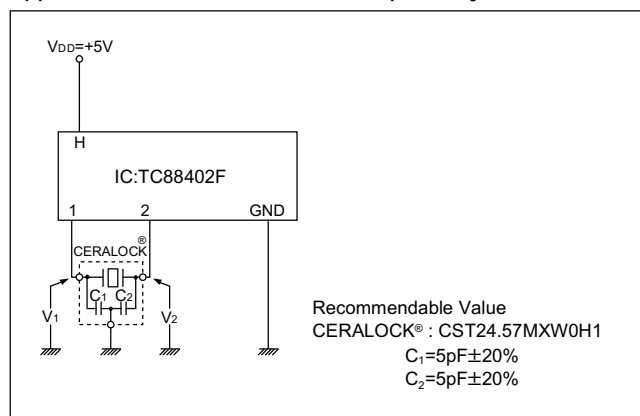
Application to MC68HC705P6 (MOTOROLA) (8-bit Microcomputer)

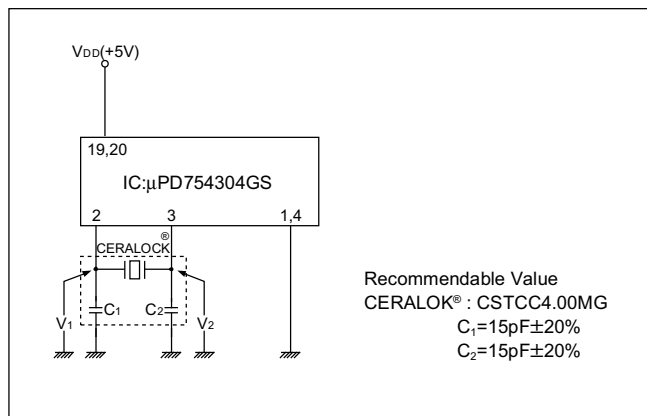


Application to M34550M4 (MITSUBISHI) (Remote Control Unit)

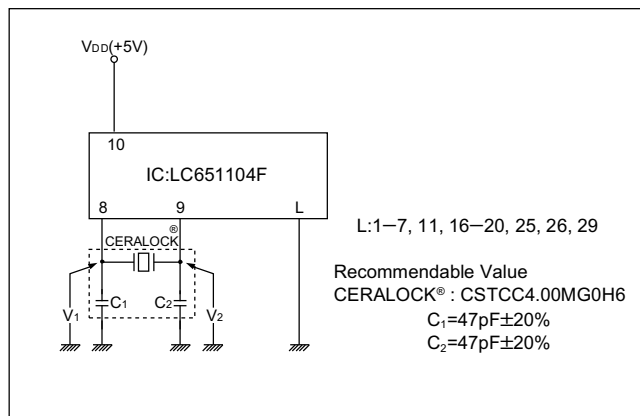


Application to TC88402F (TOSHIBA) (Speech Synthesizer)

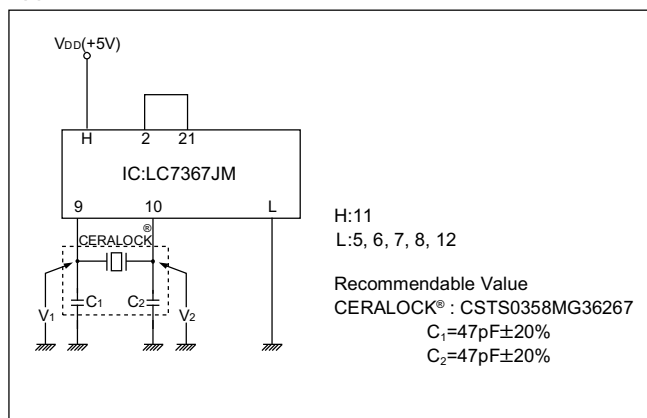


Application to μ PD754304GS (4-bit Microcomputer)

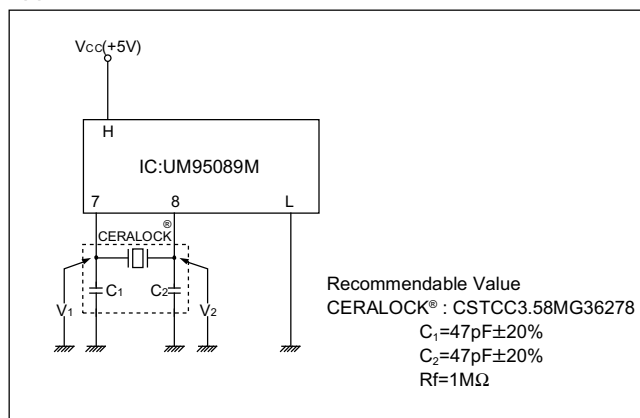
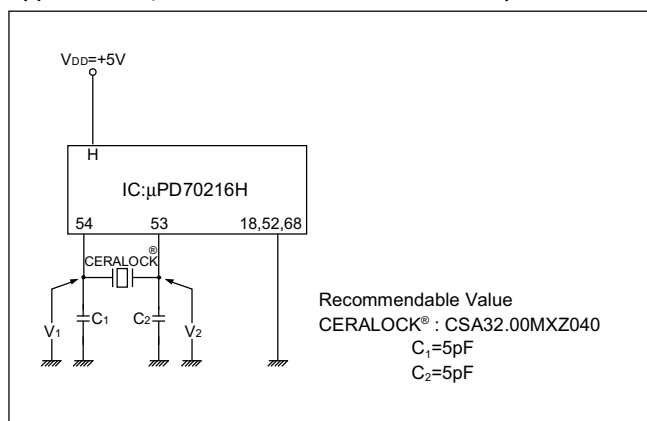
Application to 651104F (SANYO) (4-bit Microcomputer)



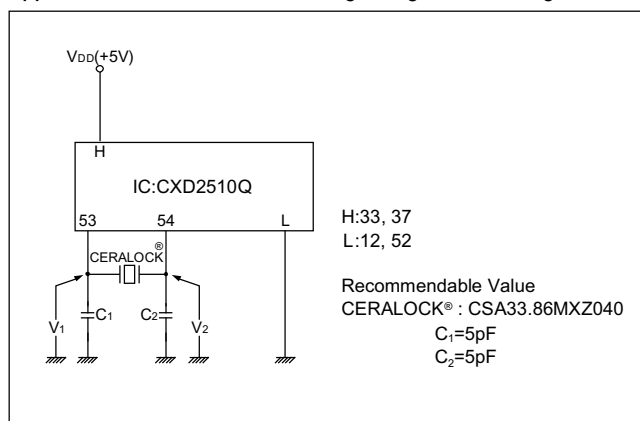
Application to LC7367JM (SANYO) (Tone / Pulse Dialer)



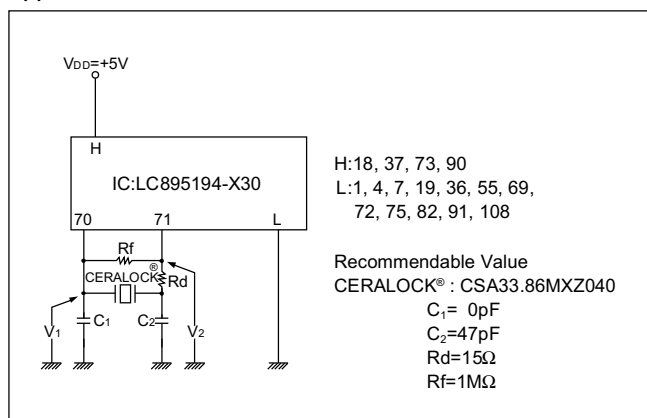
Application to UM95089M (UMC) (Tone / Pulse Dialer)

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

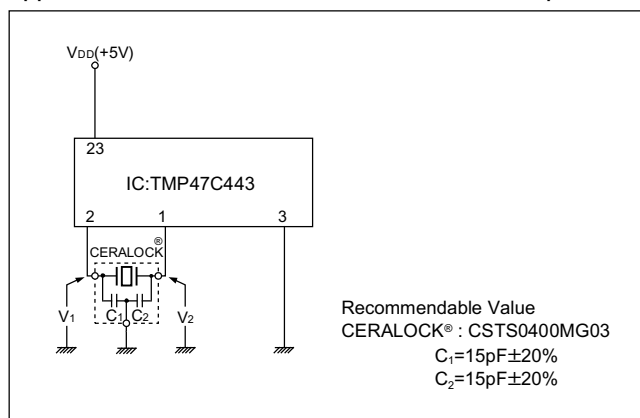
Application to CXD2510Q (SONY) (Digital Signal Processing IC for CD)



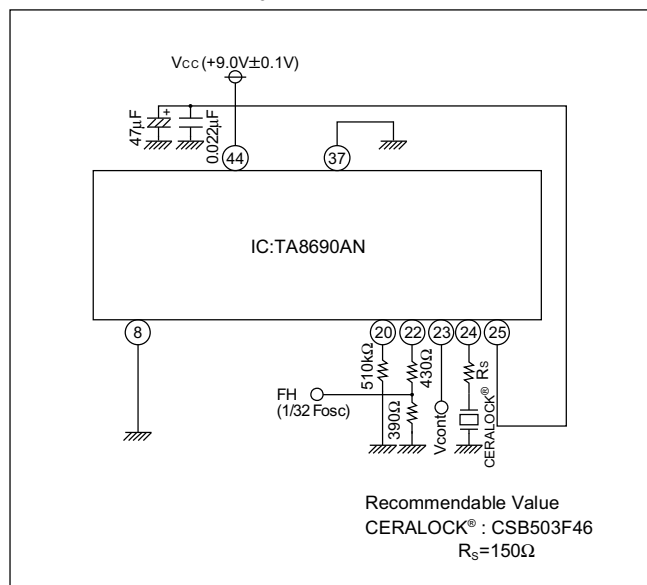
Application to LC895194-X30 (SANYO)



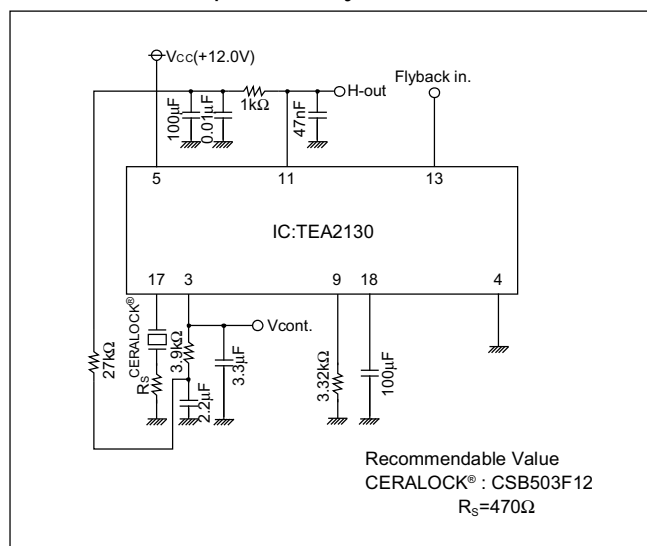
Application to TMP47C443 (TOSHIBA) (4-bit Microcomputer)



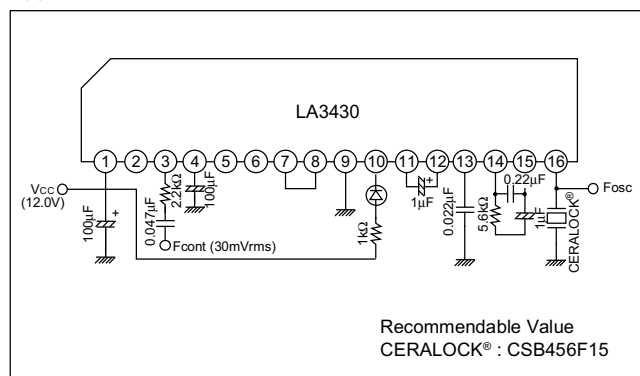
Application to TA8690AN (TOSHIBA) (TV Horizontal / Vertical Synthesizer Circuit)



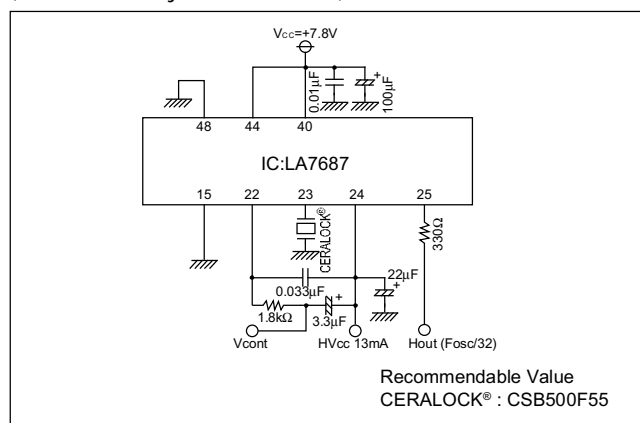
Application to TEA2130 (THOMSON) (TV Horizontal / Compatible with synthesizer Circuit)



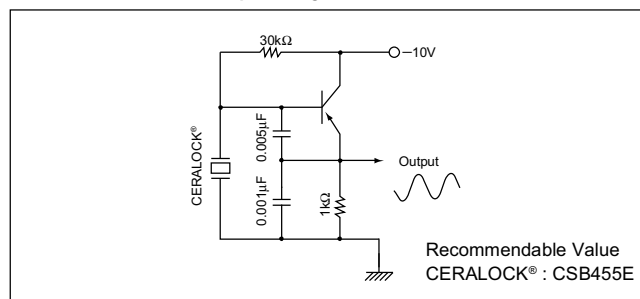
Application to LA3430 (SANYO) (FM Stereo MPX)



Application to LA7687 (SANYO) (TV Horizontal Synthesizer Circuit)



Oscillation Circuit incorporating Transistor



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