

## ● Part Numbering

### CERALOCK® (MHz)

(Part Number) 

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

#### ① Product ID

Product ID	
CS	Ceramic Resonators

#### ② Frequency/Capacitance

Code	Frequency/Capacitance
A	MHz with No Capacitance Built-in
T	MHz with Built-in Capacitance

#### ③ Structure/Size

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

#### ④ Nominal Center Frequency

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

#### ⑤ Design

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

□□ indicates initial frequency tolerance and load capacity.

#### ⑥ Initial Frequency Tolerance

Code	Initial Frequency Tolerance
5	±0.5%
3	±0.3%
2	±0.2%
1	±0.1%
H	±0.07%

#### ⑦ Load Capacity

Code	Load Capacity
1	5/6pF
2	10pF
3	15pF
4	22pF
5	30/33/39pF
6	47pF

#### ⑧ Individual Specification

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

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

#### ⑨ Packaging

Code	Packaging
-B0	Bulk
-A0	Radial Taping $H_0=18mm$
-R0	Plastic Taping $\phi=180mm$
-R1	Plastic Taping $\phi=330mm$

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

# Ceramic Resonators (CERALOCK®)

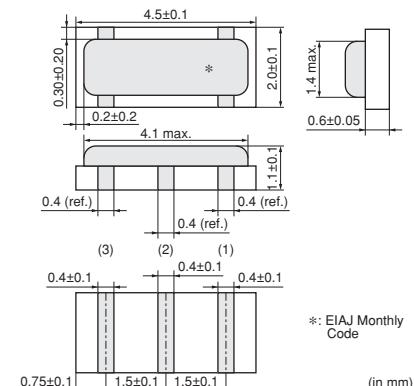
**muRata**

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

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



CSTCR\_G15C  
4.00-7.99MHz



\*: EIAJ Monthly Code

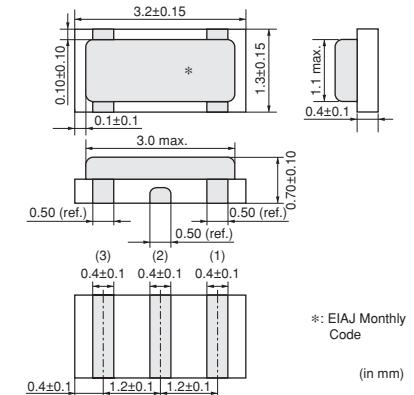
(in mm)

### ■ Features

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



CSTCE\_G15C  
8.00-13.99MHz



\*: EIAJ Monthly Code

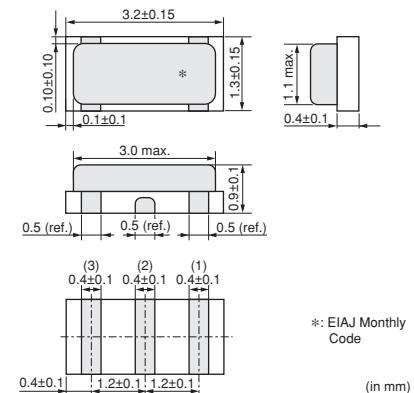
(in mm)

### ■ Applications

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



CSTCE\_V13C  
14.00-20.00MHz



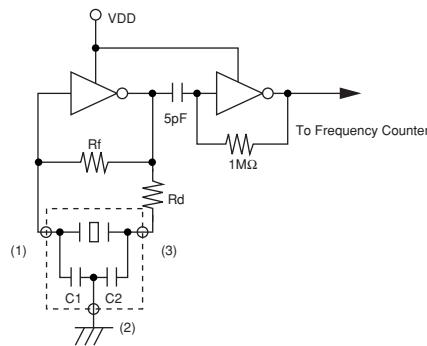
\*: EIAJ Monthly Code

(in mm)

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

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

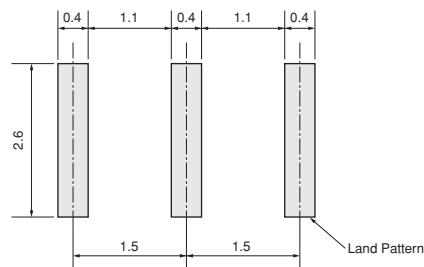
## ■ Oscillation Frequency Measuring Circuit



## ■ Standard Land Pattern Dimensions

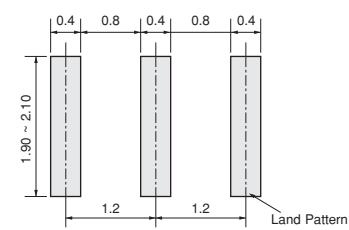
CSTCR\_G15C

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



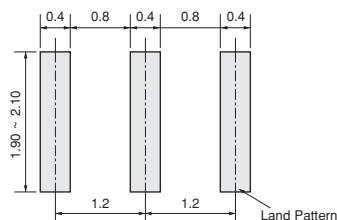
(in mm)

CSTCE\_G15C



(in mm)

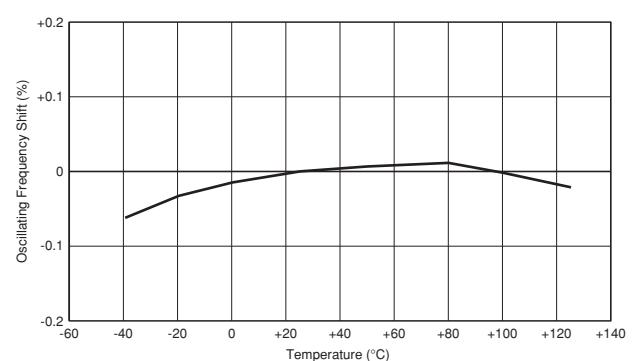
CSTCE\_V13C  
 (\* This Land Pattern is not common to CSTCE\_V.)



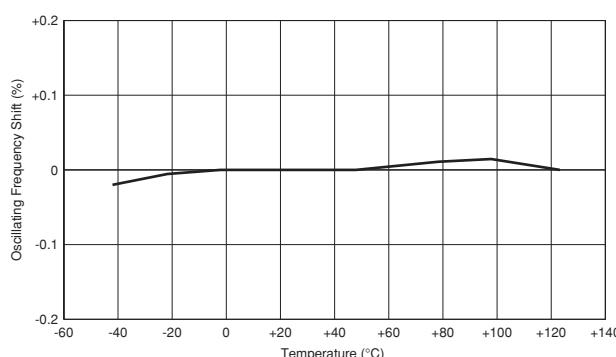
(in mm)

## ■ Oscillation Frequency Temperature Stability

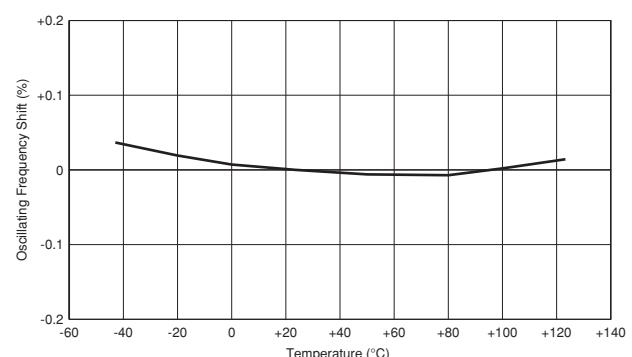
CSTCR\_G15C



CSTCE\_G15C



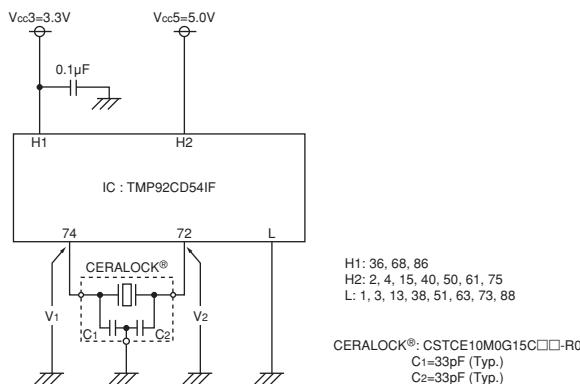
CSTCE\_V13C



## Application Circuits Utilization

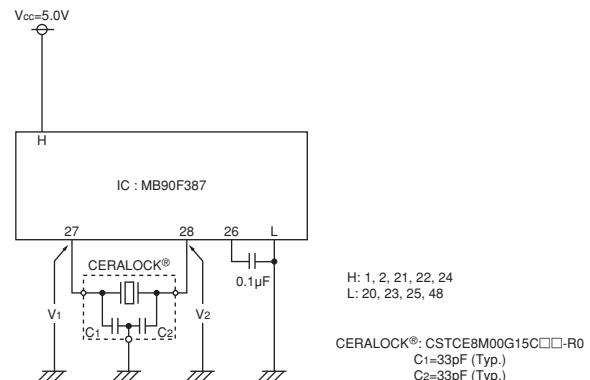
## ■ TMP92CD54IF (Toshiba)

## 16-bit Microcomputer



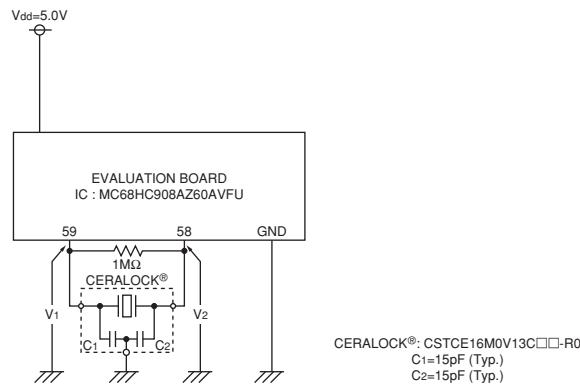
## ■ MB90F387 (Fujitsu)

## 16-bit Microcomputer



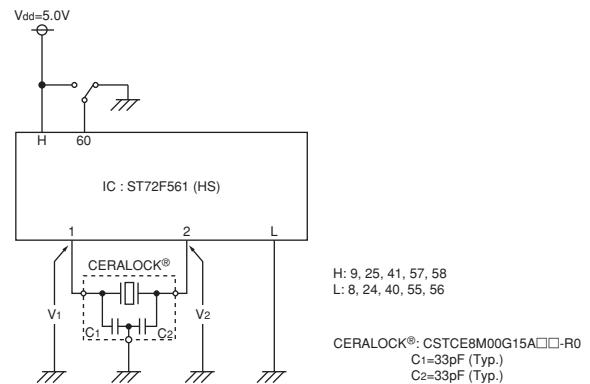
## ■ MC68HC908AZ60AVFU (Freescale)

## 8-bit Microcomputer



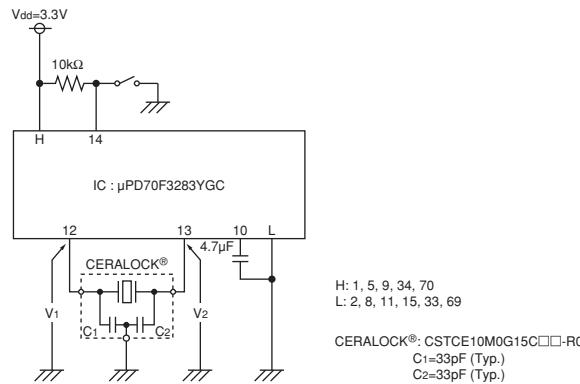
■ ST72F561 (HS) (ST Microelectronics)

## 8-bit Microcomputer



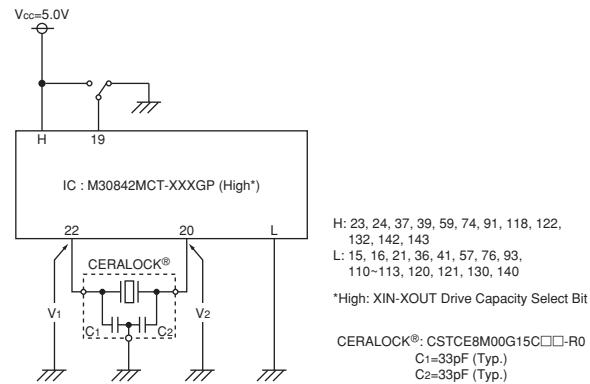
## ■ μPD70F3283YGC (Renesas)

## 32-bit Microcomputer



■ M30842MCT-XXXGP (Renesas)

## 16-bit Microcomputer



# Ceramic Resonators (CERALOCK®)

**muRata**

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

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

### ■ Features

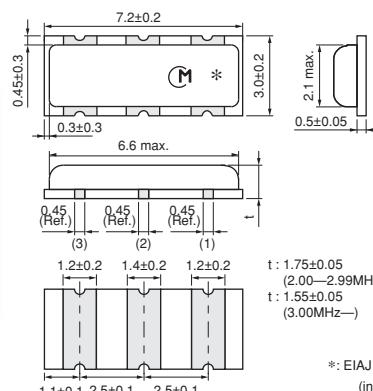
1. The series has high reliability and is available for a wide temperature range.
2. Oscillation circuits do not require external load capacitors.
3. The series is available in a wide frequency range.
4. The resonators are extremely small and have a low profile.
5. No adjustment is necessary for oscillation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

### ■ Applications

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

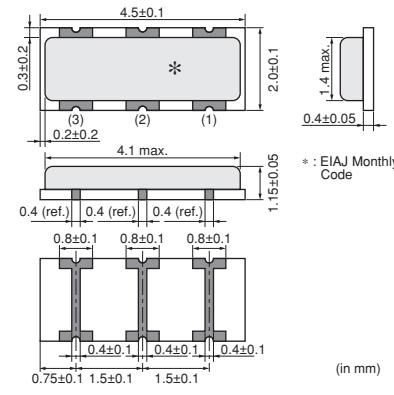
CSTCC\_G\_A  
2.00-3.99MHz



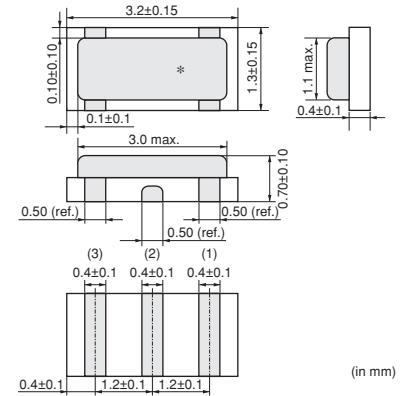
CSTCR\_G\_B  
4.00-7.99MHz



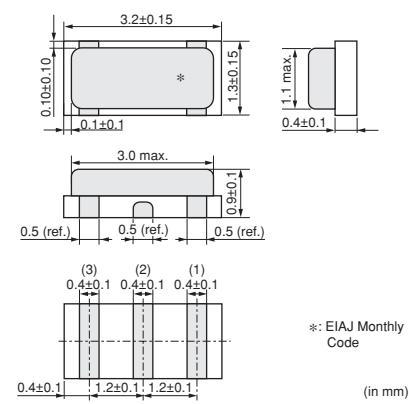
CSTCE\_G\_A  
8.00-13.99MHz



CSTCE\_V\_C  
14.00-20.00MHz



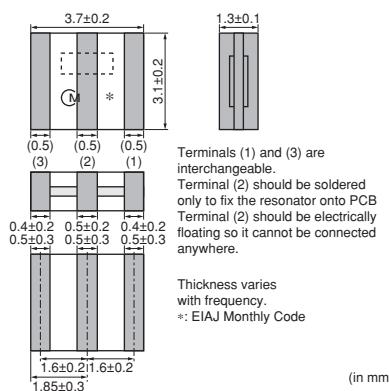
Continued on the following page. 

**muRata**

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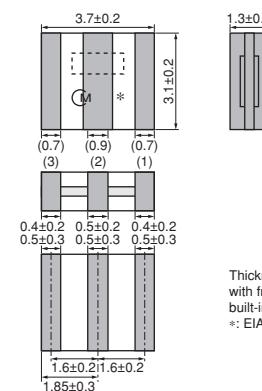
CSACV\_X\_Q  
20.01-70.00MHz



(in mm)



CSTCV\_X\_Q  
20.01-70.00MHz



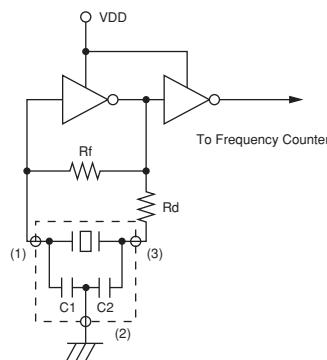
(in mm)

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

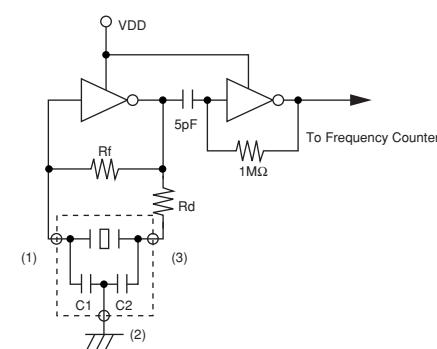
Irregular or stopped oscillation may occur under unmatched circuit conditions. Please check the actual conditions prior to use.

## ■ Oscillation Frequency Measuring Circuit

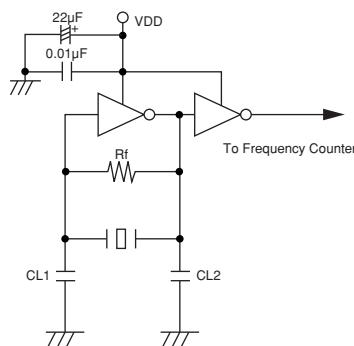
CSTCC\_G\_A



CSTCE\_G\_A/CSTCE\_V\_C/CSTCR\_G\_B/CSTCV\_X\_Q

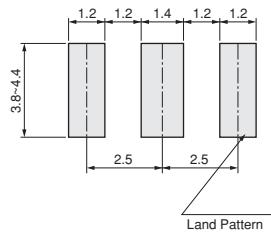


CSACV\_X\_Q



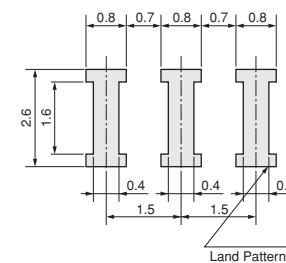
## ■ Standard Land Pattern Dimensions

CSTCC\_G\_A



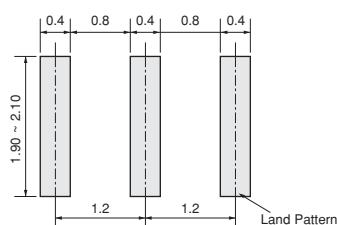
(in mm)

CSTCR\_G\_B



(in mm)

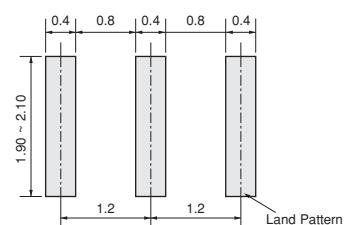
CSTCE\_G\_A



(in mm)

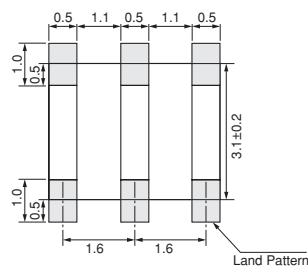
CSTCE\_V\_C

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



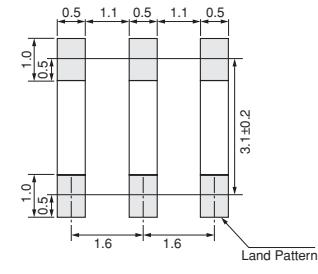
(in mm)

CSTCV\_X\_Q



(in mm)

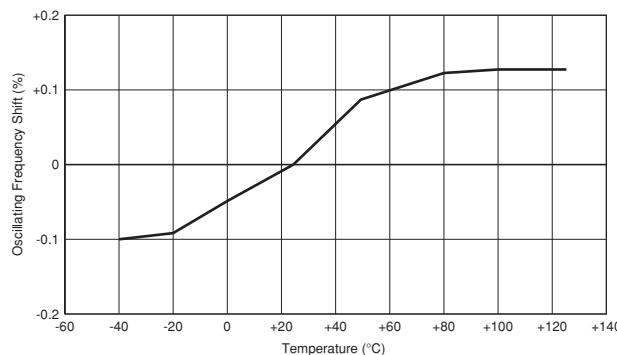
CSACV\_X\_Q



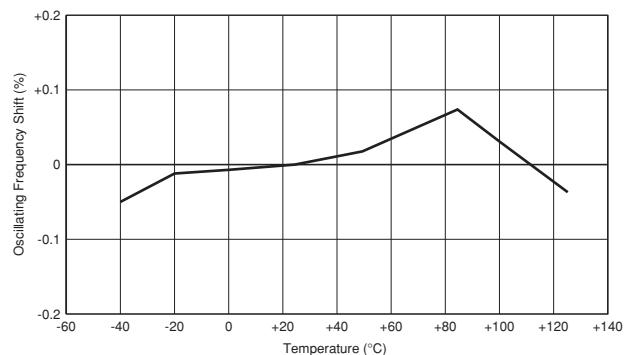
(in mm)

## ■ Oscillation Frequency Temperature Stability

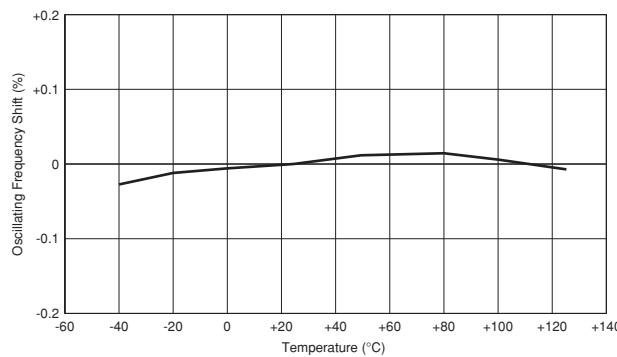
CSTCC\_G\_A



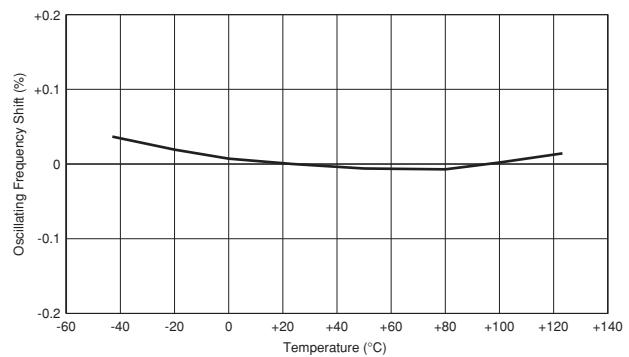
CSTCR\_G\_B



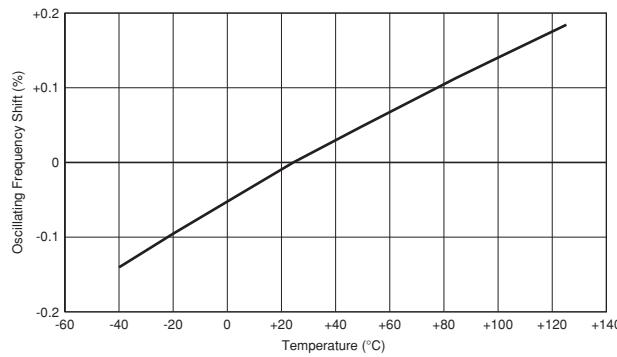
CSTCE\_G\_A



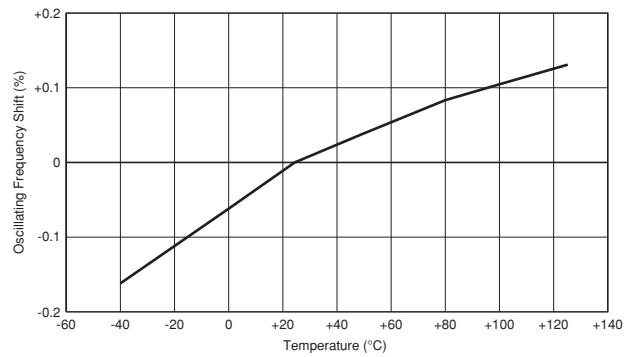
CSTCE\_V\_C



CSTCV\_X\_Q



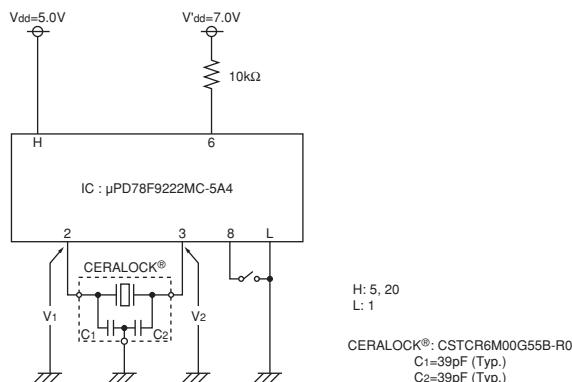
CSACV\_X\_Q



## Application Circuits Utilization

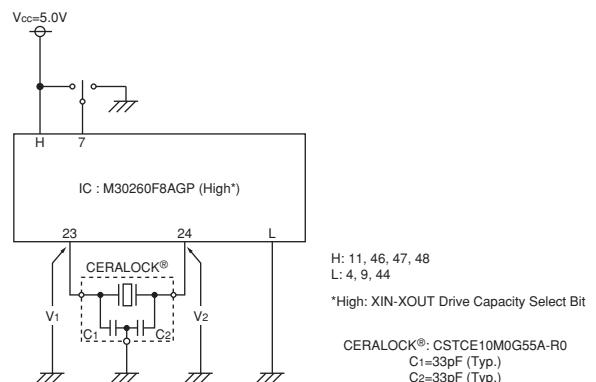
### ■ μPD78F9222MC-5A4 (Renesas)

8-bit Microcomputer



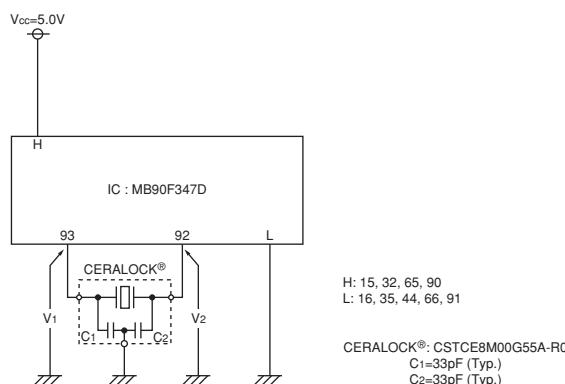
### ■ M30260F8AGP (Renesas)

16-bit Microcomputer



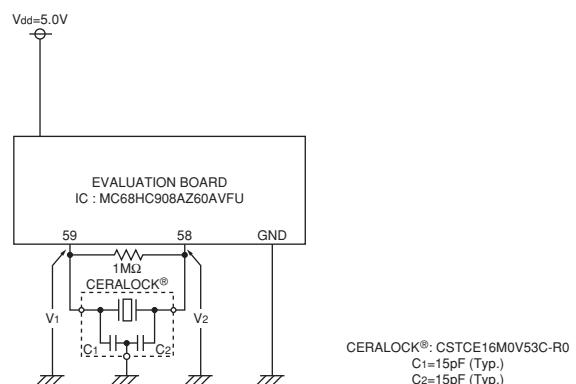
### ■ MB90F347D (Fujitsu)

16-bit Microcomputer



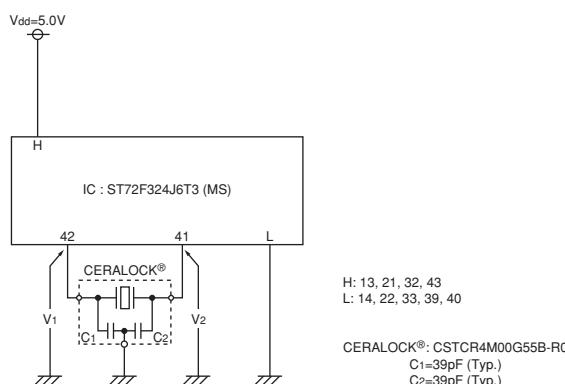
### ■ MC68HC908AZ60AVFU (Freescale)

8-bit Microcomputer



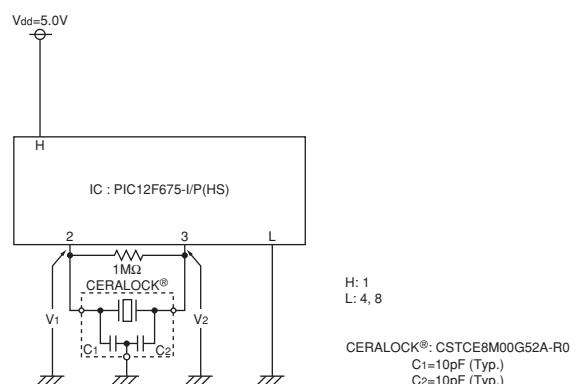
### ■ ST72F324J6T3 (MS) (ST Microelectronics)

8-bit Microcomputer



### ■ PIC12F675-I/P (HS) (Microchip)

8-bit Microcomputer



## Notice for Automotive

### ■ Soldering and Mounting (CSTCC/CSTCR/CSTCE\_V/CSTCE\_G Series)

#### 1. Soldering

##### (1) Reflow soldering

Please mount component on a circuit board by reflow soldering. Flow soldering is not acceptable.

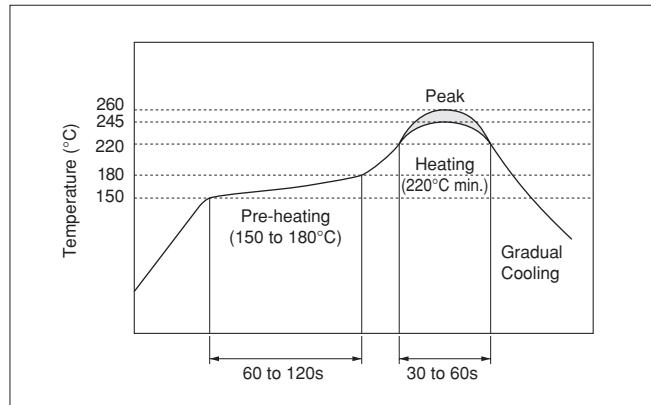
##### Recommendable Flux and Solder

Flux	Please use rosin based flux, not water soluble flux.	
Solder	Please use solder (Sn-3.0Ag-0.5Cu) under the following conditions: Standard thickness of soldering paste: 0.10 to 0.15mm.	

##### Recommendable Soldering Profile

Pre-heating	150 to 180°C	60 to 120s
Heating	220°C min.	30 to 60s
Peak Temperature	upper limit: 260°C lower limit: 245°C	1s max. 5s max.

Temperature shall be measured on the surface of component.



##### (2) Soldering with Iron

If compelled to mount the component by using soldering iron, please do not directly touch the component with the soldering iron. The component terminals or electrical characteristics may be damaged if excessive thermal stress is applied.

##### Recommendable Soldering with Iron

Heating of the soldering iron	350°C max.
Watt	30W max.
Shape of the soldering iron	ø3mm max.
Soldering Time	5s max. at one terminal
Solder	Sn-3.0Ag-0.5Cu

##### (3) Solder Volume

Please make the solder volume less than the height of the substrate to avoid damage to the seal between the metal cap and the substrate.

##### (4) Other

Do not reuse components removed from a circuit board after soldering.

##### (5) Conditions for Placement Machines

The component is recommended with placement machines that employ optical placement capabilities. The component may be damaged by excessive mechanical force. Please make sure that you have evaluated by using placement machines before going into mass production. Do not use placement machines that utilize mechanical positioning. Please contact Murata for details beforehand.

Continued on the following page.

## Notice for Automotive

Continued from the preceding page.

### 2. Wash

#### (1) Cleaning Solvents

HCFC, Isopropanol, Tap water, Demineralized water,  
Cleantthrough750H, Pine alpha 100S, Techno care FRW

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

$dT \leq 60^{\circ}\text{C}$  ( $dT$ =Component-solvent)

\*1 ex. If the component is immersed at  $+90^{\circ}\text{C}$  into  
cleaning solvent at  $+60^{\circ}\text{C}$ , then  $dT=30^{\circ}\text{C}$ .

#### (3) Conditions

##### (a) Ultrasonic Wash

1 minute max. in above solvent at  $+60^{\circ}\text{C}$  max.  
(Frequency: 28kHz, Output: 20W/l)

##### (b) Immersion Wash

5 minutes max. in above solvent at  $+60^{\circ}\text{C}$  max.

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

5 minutes max. in above solvent at  $+60^{\circ}\text{C}$  max.

#### (4) Drying

5 minutes max. by air blow at  $+80^{\circ}\text{C}$  max.

#### (5) Other

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

### 3. Coating

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.

## Notice for Automotive

### ■ Soldering and Mounting (CSTCV/CSACV Series)

#### 1. Soldering

##### (1) Reflow soldering

Please mount component on a circuit board by reflow soldering. Flow soldering is not acceptable.

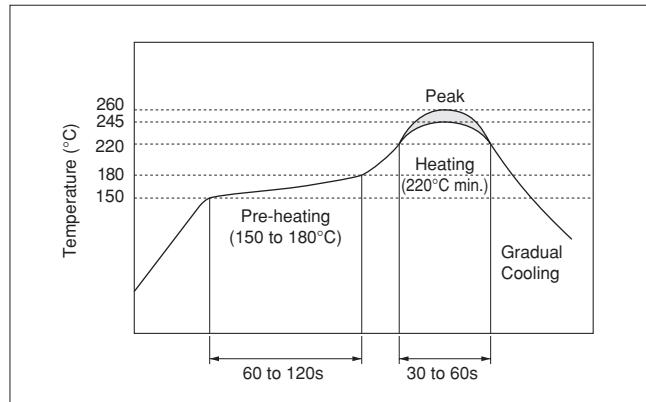
##### Recommendable Flux and Solder

Flux	Please use rosin based flux, not water soluble flux.	
Solder	Please use solder (Sn-3.0Ag-0.5Cu) under the following conditions: Standard thickness of soldering paste: 0.10 to 0.15mm.	

##### Recommendable Soldering Profile

Pre-heating	150 to 180°C	60 to 120s
Heating	220°C min.	30 to 60s
Peak Temperature	upper limit: 260°C lower limit: 245°C	1s max. 5s max.

Temperature shall be measured on the surface of component.



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If compelled to mount the component by using soldering iron, please do not directly touch the component with the soldering iron. The component terminals or electrical characteristics may be damaged if excessive thermal stress is applied.

##### Recommendable Soldering with Iron

Heating of the soldering iron	350°C max.
Watt	30W max.
Shape of the soldering iron	ø3mm max.
Soldering Time	5s max. at one terminal
Solder	Sn-3.0Ag-0.5Cu

##### (3) Other

Do not reuse components removed from a circuit board after soldering.

##### (4) Conditions for Placement Machines

The component is recommended with placement machines that employ optical placement capabilities. The component may be damaged by excessive mechanical force. Please make sure that you have evaluated by using placement machines before going into mass production. Do not use placement machines that utilize mechanical positioning. Please contact Murata for details beforehand.

## 2. Wash

### (1) Cleaning Solvents

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

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

$dT \leq 60^\circ\text{C}$  ( $dT$ =Component-solvent)

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Continued on the following page.

## Notice for Automotive

 Continued from the preceding page.

### (3) Conditions

#### (a) Ultrasonic Wash

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

#### (b) Immersion Wash

5 minutes max. in above solvent at +60°C max.  
(c) Shower or Rinse Wash  
5 minutes max. in above solvent at +60°C max.

### (4) Drying

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

### (5) Other

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

### 3. Coating

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.

## Notice for Automotive

### ■ Storage and Operating Conditions

#### 1. Product Storage Conditions

Please store the products in a room where the temperature/humidity is stable, and avoid such places where there are large temperature changes.

Please store the products under the following conditions:

Temperature: -10 to +40°C

Humidity: 15 to 85% R.H.

#### 2. Expiration Date on Storage

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

Please confirm solderability and characteristics for the products regularly.

#### 3. Notice on Product Storage

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

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

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

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

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

#### 4. Other

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

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

### ■ Rating

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

### ■ Handling

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

## Packaging for Automotive

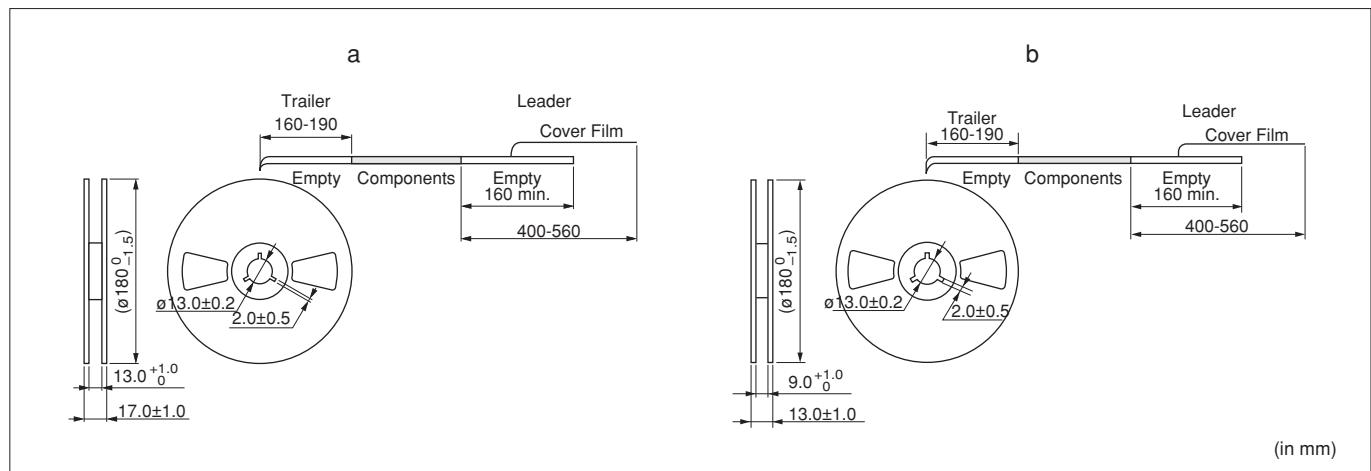
### ■ Minimum Quantity

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

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

(pcs.)

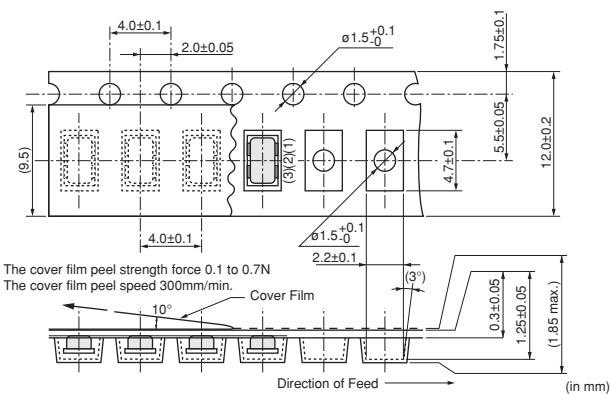
### ■ Dimensions of Reel



(in mm)

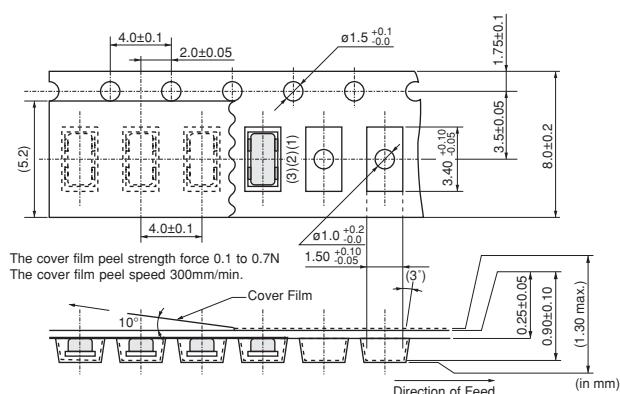
### ■ Dimensions of Taping

**CSTCR\_G15C**



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

**CSTCE\_G15C**



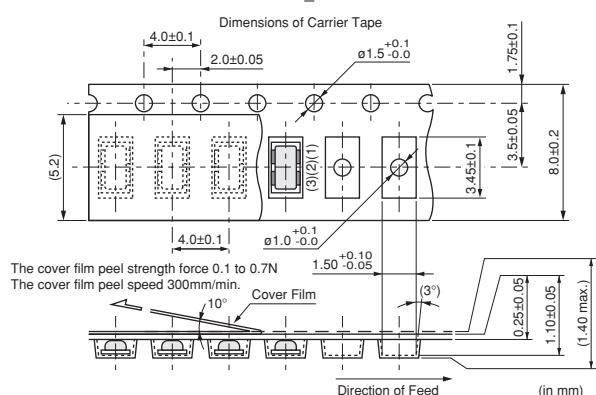
Continued on the following page.

## Packaging for Automotive

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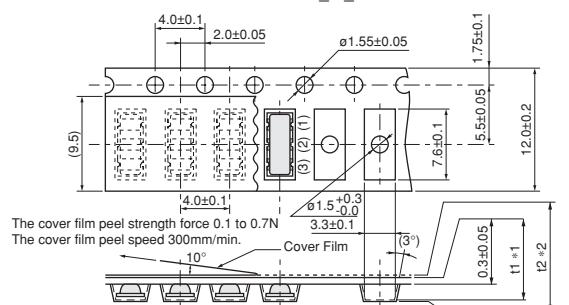
### Dimensions of Taping

CSTCE\_V13C



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

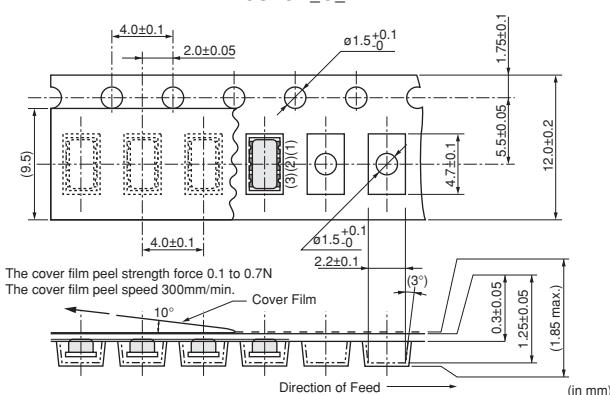
CSTCC\_G\_A



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

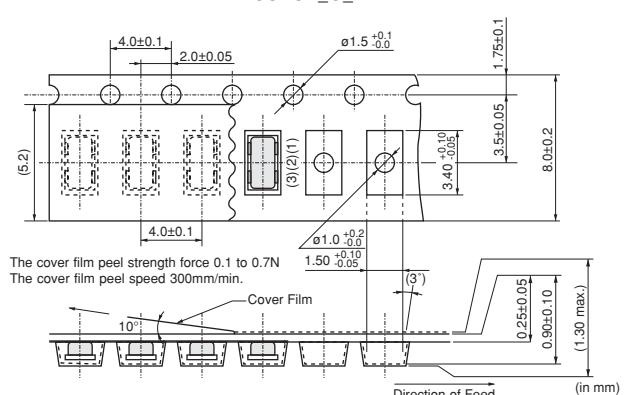
(in mm)

CSTCR\_G\_B



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

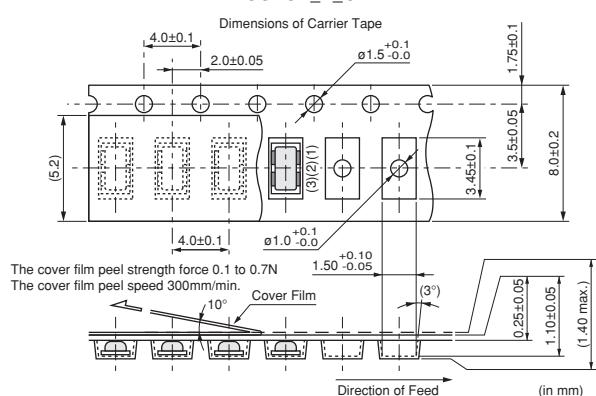
CSTCE\_G\_A



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

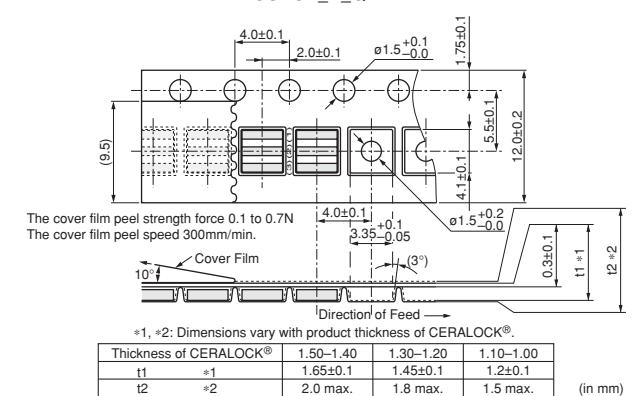
(in mm)

CSTCE\_V\_C



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

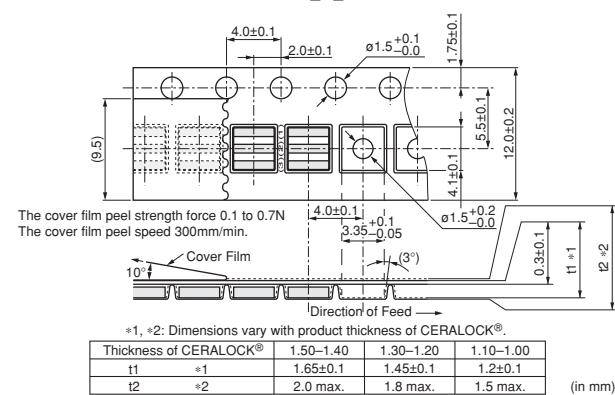
CSTCV\_X\_Q



The cover film peel strength force 0.1 to 0.7N  
 The cover film peel speed 300mm/min.

(in mm)

CSACV\_X\_Q



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

Thickness of CERALOCK®	1.50–1.40	1.30–1.20	1.10–1.00
t1 *1	1.65±0.1	1.45±0.1	1.2±0.1
t2 *2	2.0 max.	1.8 max.	1.5 max.

(in mm)

**⚠Note:**

1. Export Control  
<For customers outside Japan>  
No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.  
<For customers in Japan>  
For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.
2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

① Aircraft equipment	② Aerospace equipment
③ Undersea equipment	④ Power plant equipment
⑤ Medical equipment	⑥ Transportation equipment (vehicles, trains, ships, etc.)
⑦ Traffic signal equipment	⑧ Disaster prevention / crime prevention equipment
⑨ Data-processing equipment	⑩ Application of similar complexity and/or reliability requirements to the applications listed above
3. Product specifications in this catalog are as of September 2012. They are subject to change or our products in it may be discontinued without advance notice.  
Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.
4. Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
5. This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
6. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.



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