HUAWEI TECHNOLOGIES CO., LTD.

RECIPIENT

SPECIFICATIONS

MODEL : **VG-4232CA**

SPEC. No. : **A12-356-0B**

DATE: **Aug. 3. 2012**

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SPECIFICATIONS

I. Application

This document is applicable to the crystal oscillator that are delivered to HUAWEI TECHNOLOGIES CO., LTD. from Seiko Epson Corp.

This product complies with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Seiko Epson Corporation shall not be used for the development and manufacture of weapon of mass destruction or for other military purposes. Making available such products and technology to any third party who may use such products or technologies for the said purposes are also prohibited.

This product listed here is designed as components or parts for electronics equipment in general consumer use. We do not expect that any of these products would be incorporated or otherwise used as a component or part for the equipment, which requires an extra high reliability, such as satellite, rocket and other space systems, and medical equipment, the functional purpose of which is to keep life.

II. Product No. / Model

The model is VG-4232CA-PGCT.

III. Packing

It is subject to the packing standard of Seiko Epson Corp.

IV. Warranty

Defective parts which are originated by us are replaced free of charge in case defects are found within 12 months after delivery.

V. Amendment and abolishment

Amendment and/or abolishment of this specification are subject to the agreement between both parties.

VI. Table of contents

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[1] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	VCC	-0.5 to +7.0	V	
Input voltage	VIN	-0.5 to VCC+0.5	V	Vc Terminal
Storage temperature range *	T_stg	-55 to +125	°C	Stored as bare product after unpacking

* Concerning the frequency change, please refer [8] Environmental and mechanical characteristics.

[2] Operating range

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Supply voltage	VCC	3.135	3.300	3.465	V	*1
Supply voltage	GND	0.0	0.0	0.0	V	
Control voltage	Vc	0.00	1.65	3.30	V	
Output frequency	fo	-	61.440	-	MHz	
Operating temperature range	T_use	-40	+25	+85	°C	
Output load condition	L-CMOS	-	-	15	pF	

*1 Start up time(0 %VCC→90 %VCC) of power source should be more than 150 μs.
*2 By-pass capacitor (approx. 0.01 μF to 0.1 μF) should be placed closely between Vcc and GND.

[3] Frequency characteristics

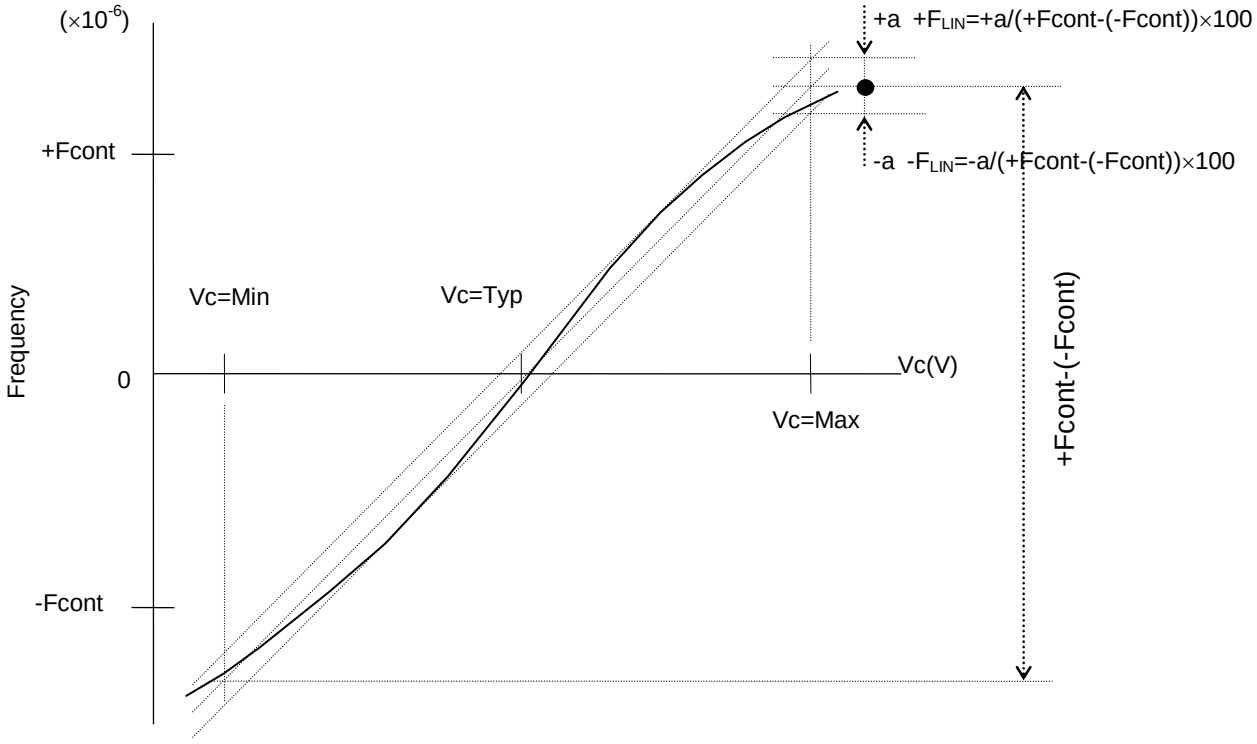
1) Output Frequency (fo) 61.440000 MHz

2) Frequency Characteristics

Parameter	Symbol	Value[1×10^{-6}]	Note
Initial frequency tolerance	f_ini	± 10	
Frequency temperature coefficient	fo_Tc	± 20	T_use=-40 °C to +85 °C
Frequency voltage coefficient	fo_Vcc	± 3	Vcc=3.3 V±0.165 V
Frequency load coefficient	fo_Load	± 1	CL=15 pF±10%
Frequency aging	f_aging	± 3	Vcc=3.3 V, Vc=1.65V, 25 °C, 1year

3) Output Frequency Pulling Characteristics

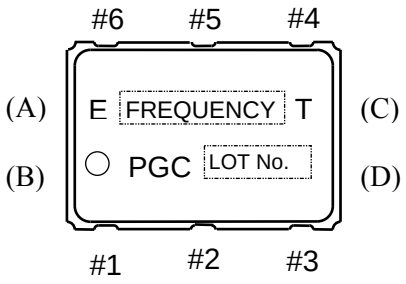
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Absolute pulling range	APR	$\pm 50\times10^{-6}$	-	$\pm 150\times10^{-6}$	-	Vc=1.65 V±1.65 V
Input resistance	Rin	2	-	-	Mohm	-
Linearity	F_{LIN}	-	-	±10	%	-
Modulation band width	BW	20	-	-	kHz	±3 dB
Frequency change polarity	-	Positive polarity			-	-



Exsample of controling freaquency characteristics

[4] Terminal description

Top View



Name	No.	Type	Terminal description
Vc	#1	INPUT	Vc terminal
OE	#2	−	OE terminal / Active High
GND	#3	−	GND terminal
OUT	#4	OUTPUT	Clock output terminal
N.C.	#5	−	N.C. terminal
Vcc	#6	−	Vcc terminal

[5] Electrical characteristics

(Please see page 2 [2] Operating range)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ	Max		
Start up time	t_str	-	-	10	ms	0sec at 90 % Vcc
Current consumption	Icc	-	-	40	mA	-
Disable current	I_dis			25	mA	OE=GND
Rise time	tr	-	-	5	ns	20 %Vcc → 80 %Vcc
Fall time	tf	-	-	5	ns	80 %Vcc → 20 %Vcc
Symmetry	SYM	45	-	55	%	50 %Vcc Level
High level output voltage	V_{OH}	2.7	-	-	V	-
Low level output voltage	V_{OL}	-	-	0.3	V	-
High level input voltage	V_{IH}	70 %Vcc	-	-	V	-
Low level input voltage	V_{IL}	-	-	30 %Vcc	V	-
Disable time	tpxz	-	-	100	ns	OE terminal HIGH → LOW
Enable time	tpzx	-	-	100	ns	OE terminal LOW → HIGH
Spurious	-	-	-	50	dBc	-

[6] Test circuit. [7] Output waveform.

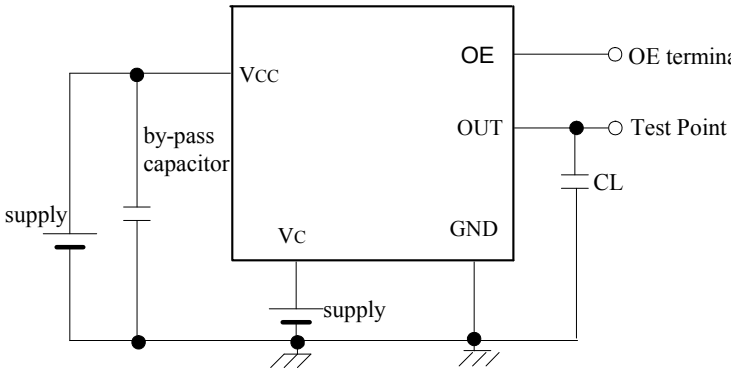
Phase Noise Characteristic

Frequency [MHz]	Offset Frequency					
	10 Hz [dBc/Hz]	100 Hz [dBc/Hz]	1 kHz [dBc/Hz]	10 kHz [dBc/Hz]	100 kHz [dBc/Hz]	1 MHz [dBc/Hz]
61.44	-70 max	-90 max	-125 max	-140 max	-145 max	-145 max

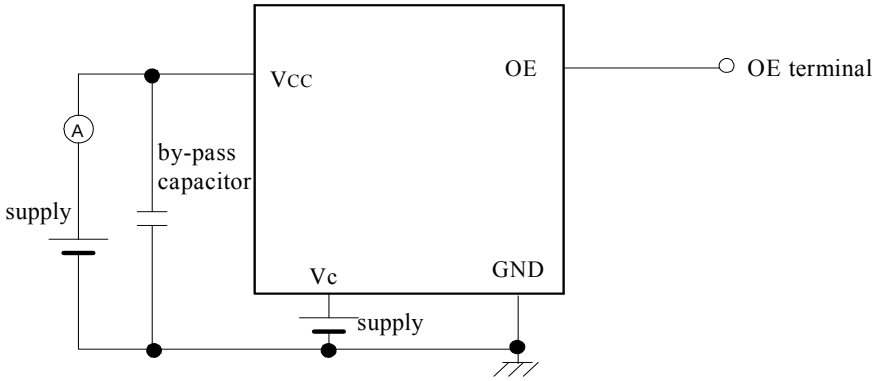
Phase Jitter Characteristic
Phase Jitter = 15 ps max(Offset Frequency:12 kHz ～ 20 MHz)

[6] Test circuit

1) Waveform observation



2) Current consumption



3) Condition

(1) Oscilloscope

- Bandwidth should be 5 times higher than DUT's output frequency.
- Probe ground should be placed closely from test point and lead length should be as short as possible.

(2) CL includes probe capacitance.

(3) By-pass capacitor (approx. 0.01 μF～0.1 μF) should be placed closely between Vcc and GND.

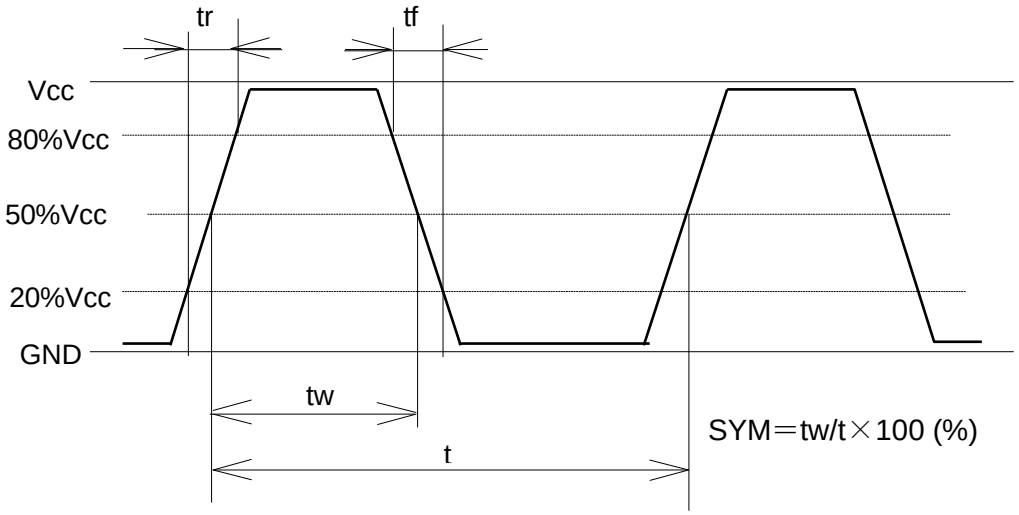
(4) Use the current meter whose internal impedance value is small.

(5) Power supply

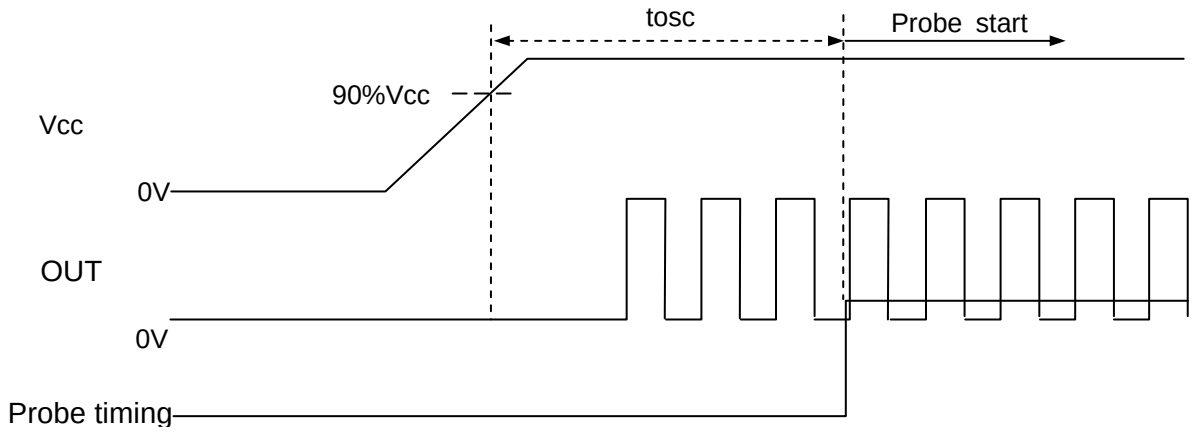
- Start up time(0 V→90 %Vcc)of power source should be more than 150us.
- Impedance of power supply should be as low as possible.

[7] Timing chart

1) Output wave form and measurement level

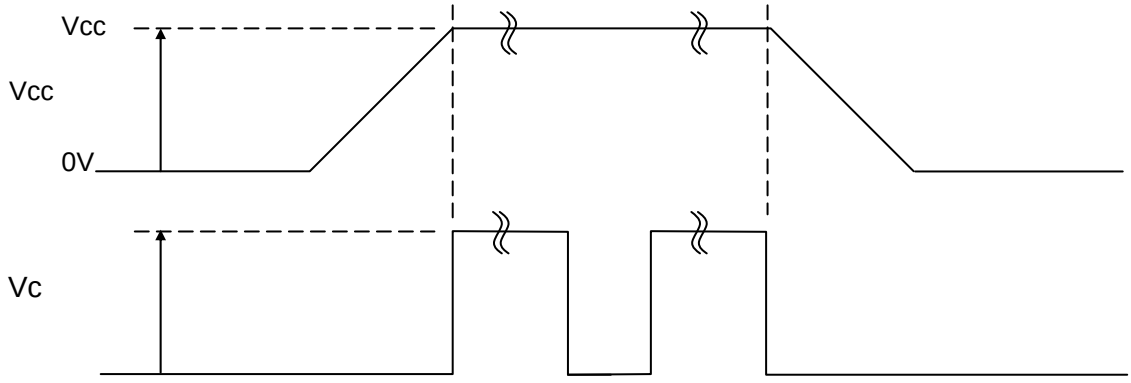


2) Output Signal timing



3） Vc control timing

＊Please rise up the Vc voltage after the Vcc voltage rises up.



[8] Environmental and mechanical characteristics

*EPSON evaluation condition : Evaluated by the following examination items and conditions.

No.	Item	Value *1		Test Conditions
		Δ f / f *2 [1×10^{-6}]	Electrical characteristics	
1	High temperature storage *3	±10	Satisfy [5] specification after test	+85 °C × 1 000 h
2	Low temperature storage *3	±10		-40 °C × 1 000 h
3	High temp. humidity storage *3	±10		+85 °C × 85 %RH × 1000 h
4	Temperature cycle *3	±10		-55 °C ~ +125 °C 30 min. at each temp. 100 cycles
5	Resistance to soldering heat	±10		For conventional reflow soldering furnace (3 times) Ref. IPC/JEDEC J-STD-020D
6	Vibration	± 5		10 Hz to 85 Hz amplitude 1.5 mm 85 Hz to 2 000 Hz acceleration 20 G 10 Hz → 2 000 Hz → 10 Hz 20 min./cycle 12 h (4 h × 3 directions)
7	Shock	± 5		1000 G 1/2 sine wave 3 shocks in X,Y,Z (Total of 9 shocks).
8	Drop	± 5		Free drop from 750 mm height on a hard wooden board for 3 times in X,Y,Z (Total of 9 times).
9	Sealing	1×10^{-9} Pa·m^3/s Max.		For He leak detector

< Notes >

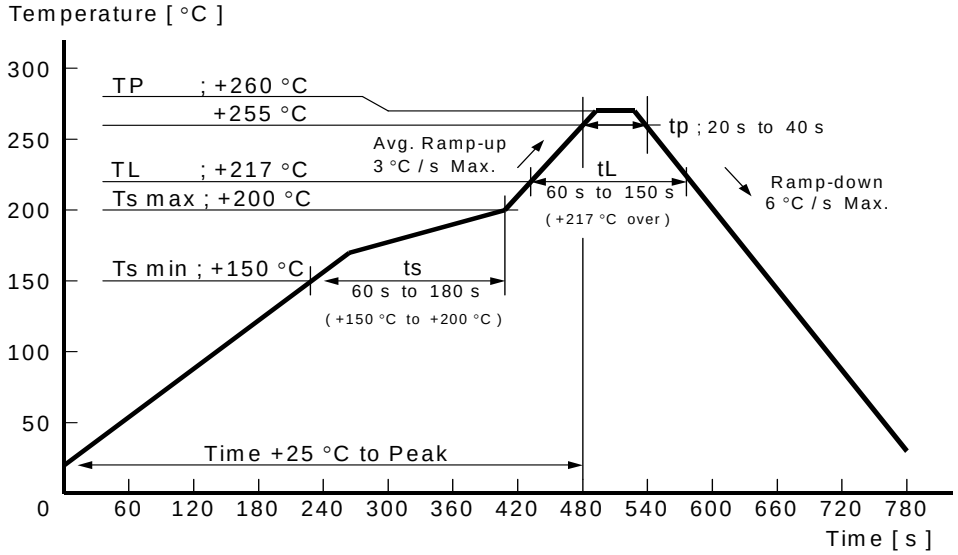
*1 Each test done independently.

*2 Measuring 1 h to 24 h later leaving in room temperature after each test.

*3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.

Pre-conditioning: Reflow (3 time)

Convection reflow condition (Ref. IPC/JEDEC J-STD-020D)



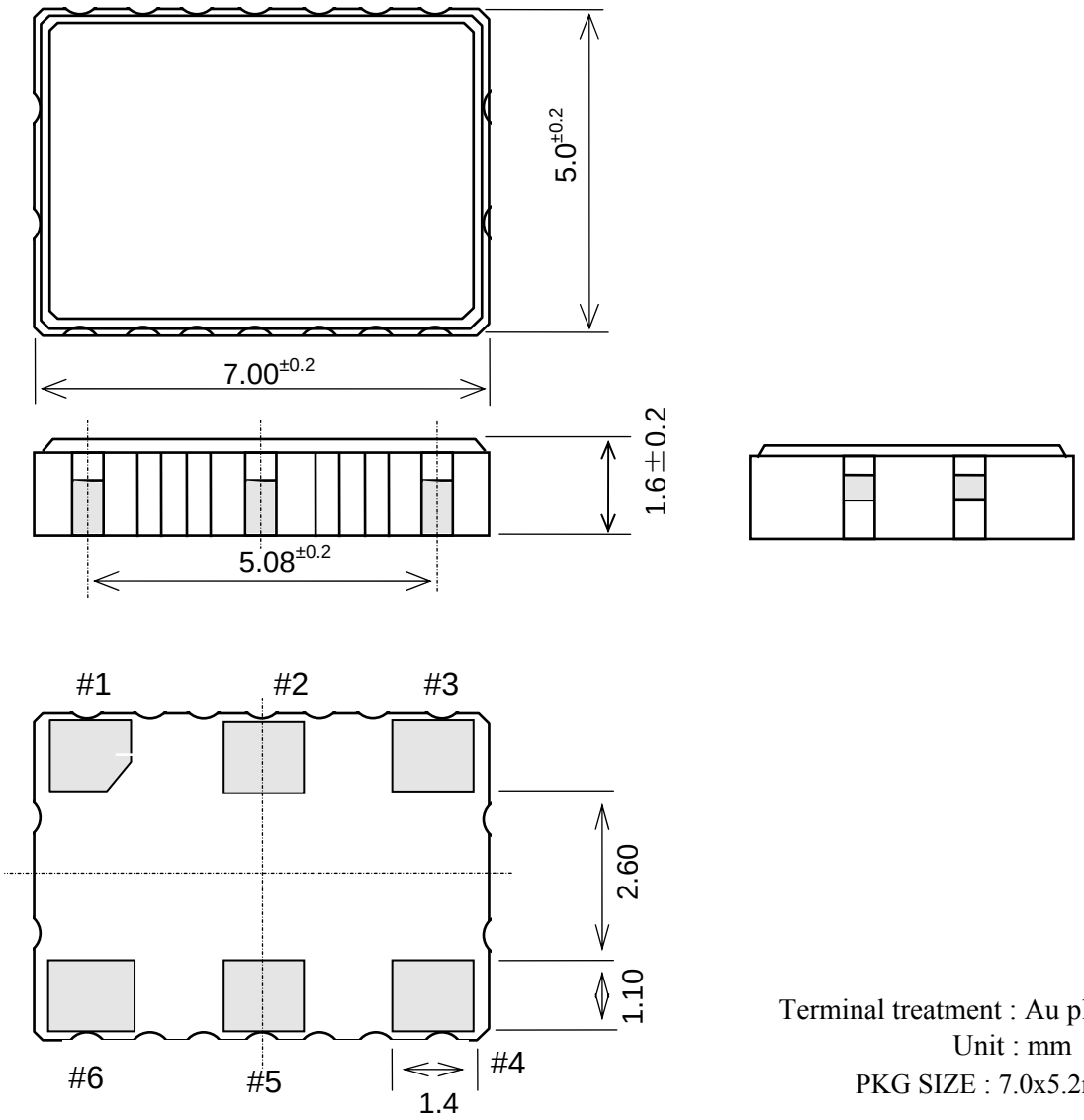
[9] Electro Static Discharge

・ESD

Item	Value	Condition
Human Body Model (HBM)	±2 000 V	Ref. EIAJ ED-4701-1 C111A 100 pF, 1.5 kΩ, 3 times
Machine Model (MM)	±200 V	Ref. EIAJ ED-4701-1 C111 200 pF, 0 Ω, 1 time

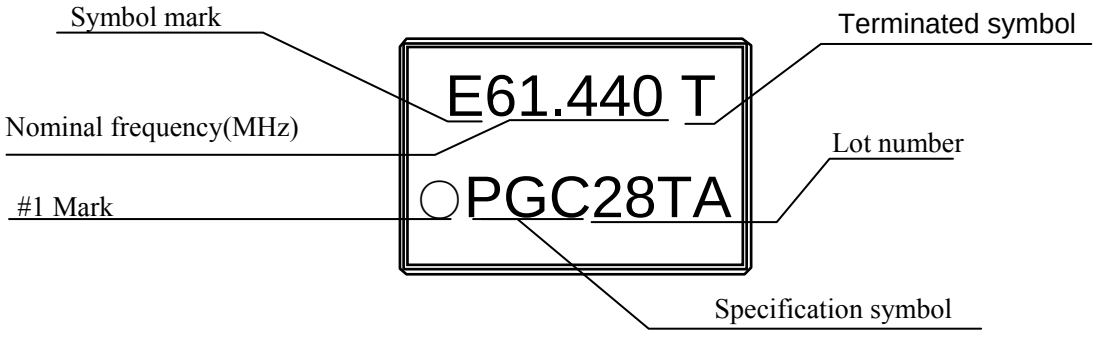
[10] Dimensions and marking layout

1) Dimensions



Terminal treatment : Au plating
Unit : mm
PKG SIZE : 7.0x5.2mm

2) Marking layout



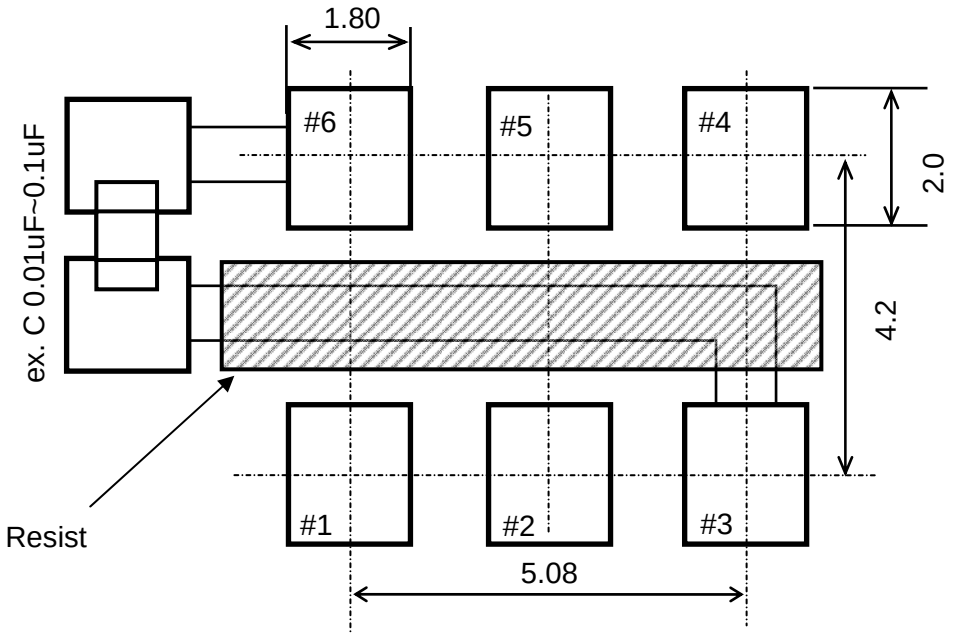
- ♦ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.
- ♦ We show output frequency to the third decimal place and round down the forth decimal place.

[11] Board patterning

The soldering pad sample indicated as like following.

Please design implementation density and the soldering reliability after confirmation.

Soldering position (Unit : mm)



[12] Notes

1) This device is made with C-MOS IC.
Please take necessary precautions to prevent damage due to electrical static discharge.

2) We recommend placing a 0.01 to 0.1 μF capacitor closely between Vcc and GND to obtain stable operation and protest against power line ripple.

3) Vcc and GND pattern shall be as large as possible so that high frequency impedance shall be small.

4) EPSON cannot recommend to put filtering element into power line so as to reduce noise. Oscillator might be unstable oscillation because high frequency impedance of power line become higher. When use filtering element, please verify electrical construction and or element's spec.

5) EPSON doesn't recommend to power on from intermediate electric voltage or extreme fast power on. Those powering conditions may cause no oscillation or abnormal oscillation.

6) Power ripple: 200 mV P-P max.
Start up time (0 → 90 % Vcc) of power source should be more than 150 μs.

7) A long output line may cause irregular output, so try to make the output line as short as possible.

8) Other high level signal lines may cause incorrect operation, so please do not place high-level signal line close to this device.

9) This device contains a crystal resonator, so please do not expose to excessive shock or vibration.

10) An automatic insertion is available, however, the internal SAW resonator might be damaged in case that too much shock or vibration is produced mechanically.
Be sure to check your machine condition in advance.

11) Ultrasonic cleaning can be used on this product, however, since the oscillator might be damaged under some conditions, please exercise caution in advance.

12) We recommend to use and store under room temperature and normal humidity to secure frequency accuracy and prevent moisture.

13) The metal part of the surface (metal cap) is connected to GND #3 pin.
Please take necessary precautions to prevent short circuit to GND by contact with the metal cap.

14) Side leads (A) to (D) are connected to IC internally.
Therefore be careful for short or a fall of insulation resistance etc.

15) Recommendation reflow times are less than 2 times.
When there was a soldering error, please do alteration with a soldering iron.
In this case, the iron ahead is equal to or less than +350 ℃ and asks within 5 s.
In case that this device is reflow soldered on the back side of your circuit board, please carefully verify the device is properly secured to prevent coming detached from card.

[About soldering method]

Soldering method	OK or NG
Reflow soldering (top side)	OK
Reflow soldering (back side)	Please carefully verify the device is properly secured to prevent coming detached from card.
Solder pot (static solder pot / flow solder pot)	NG
Iron soldering	OK

TAPING SPECIFICATION

Ⅰ. Application

This standard will apply to 7×5 Ceramic package.

Spec：CA package

Ⅱ. Contents

Item No.	Item	Page
〔1〕	Taping specification	1 to 2
〔2〕	Inner carton	3
〔3〕	Shipping carton	
〔4〕	Marking	4
〔5〕	Quantity	
〔6〕	Storage environment	
〔7〕	Handling	

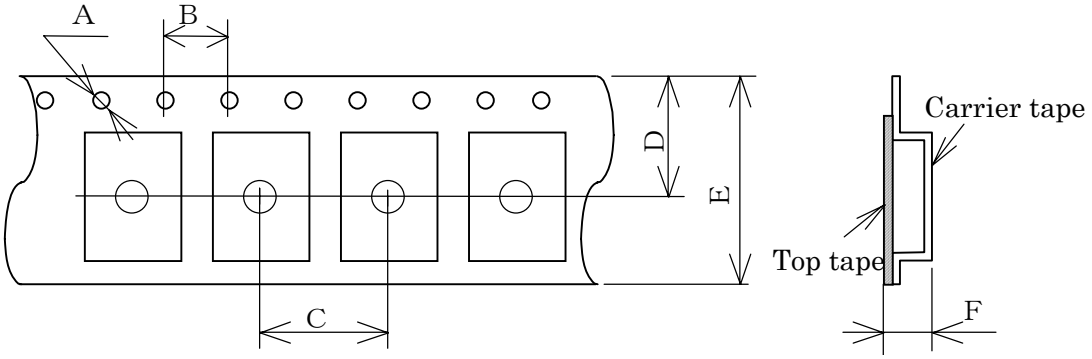
〔1〕 Taping specification

Subject to「EIA-481」and「IEC-60286」

(1) Tape dimensions TE-1612L

Material of the carrier tape : PS

Material of the top tape : PET

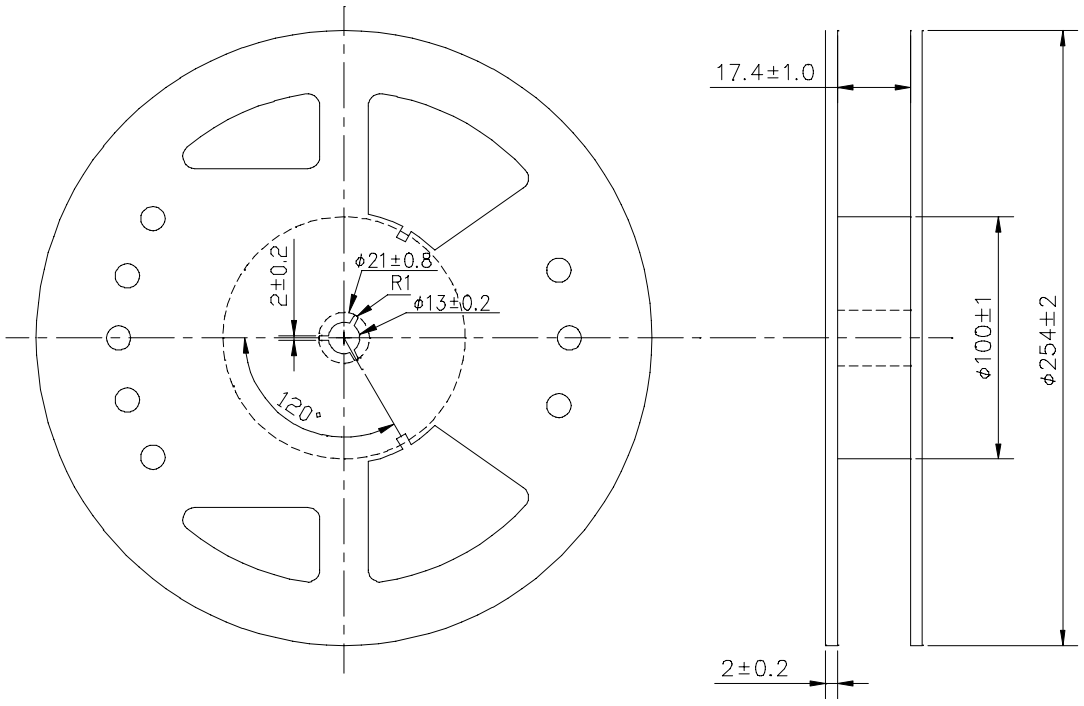


Symbol	A	B	C	D	E	F
Value	ϕ 1.5	4.0	8.0	9.25	16.0	2.3

Unit : mm

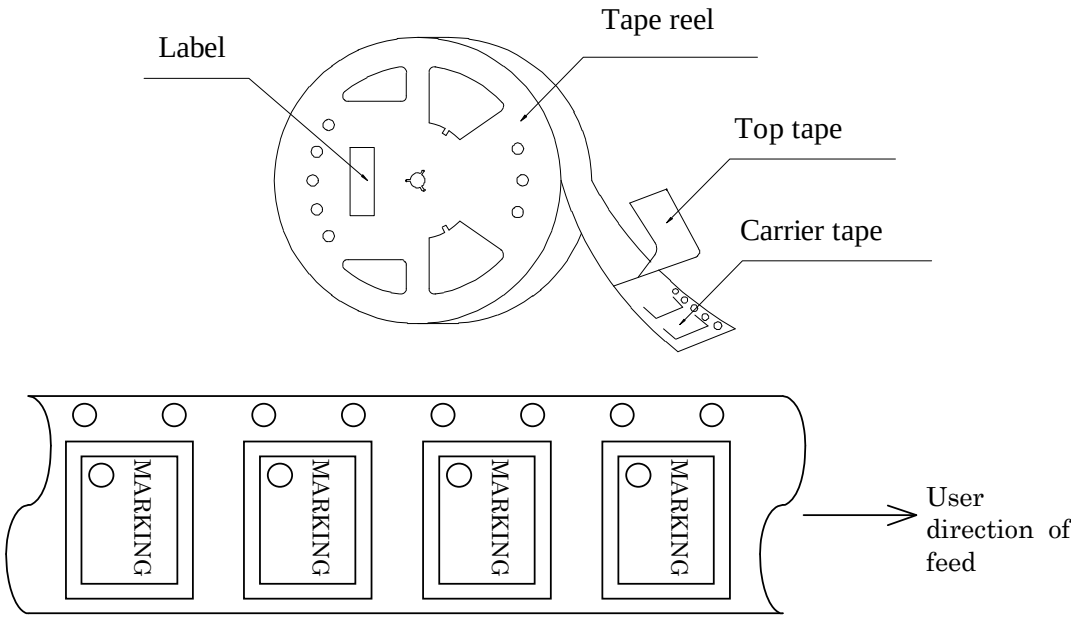
(2) Reel dimensions

Material of the reel : Conductive polystyrene

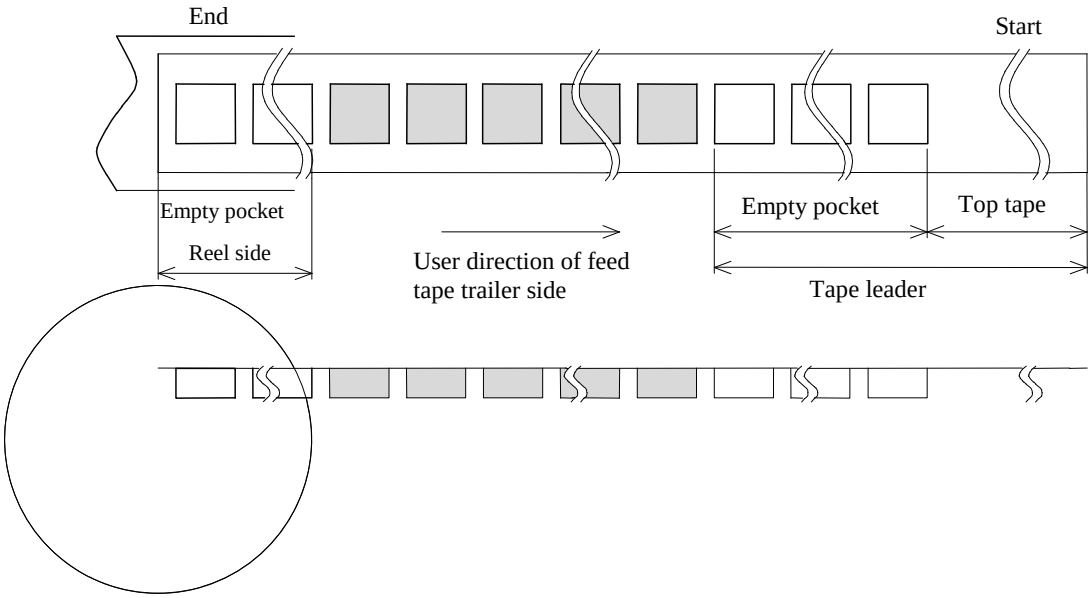


(3) Packing

①Tape & reel



②Start & end point



Item		Empty space
Tape leader	Top tape	Min. 1 000 mm
	Carrier tape	Min. 160 mm
Tape trailer	Top tape	Min. 0 mm
	Carrier tape	Min. 160 mm

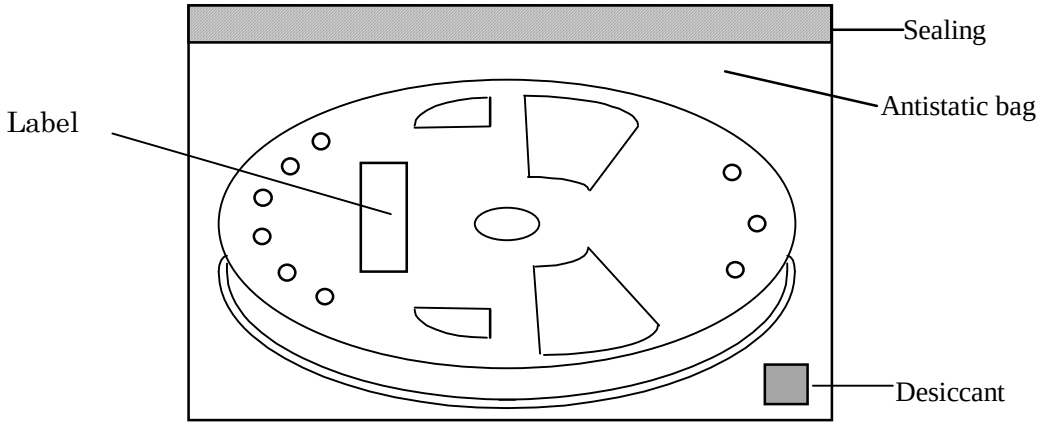
(4) Peel force of the cover tape

① angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.

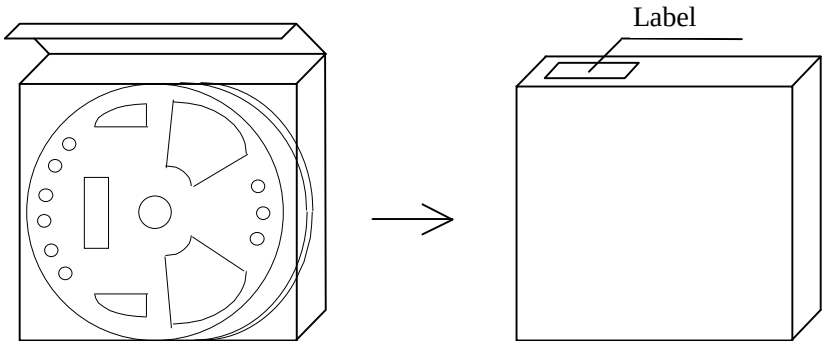
② peel speed : 300 mm / min.

〔2〕 Inner carton

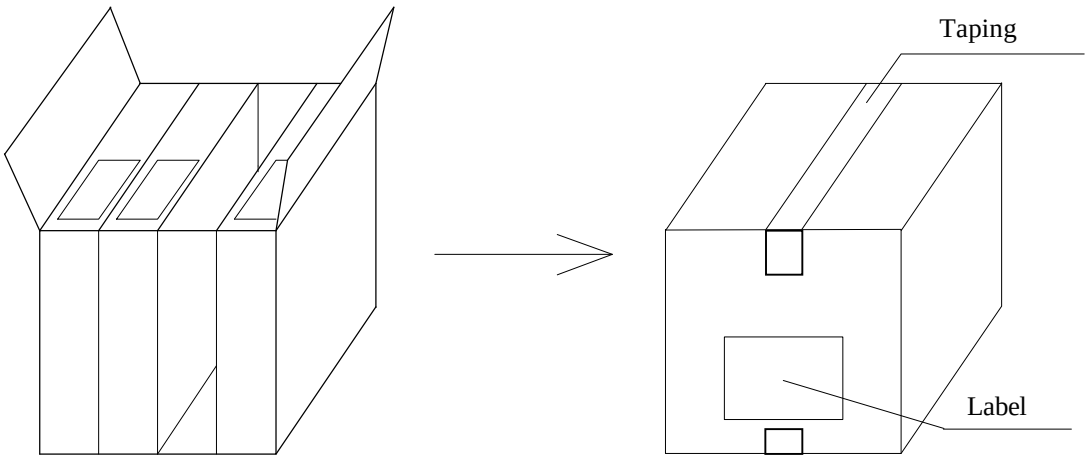
a) Packing to antistatic bag



b) Packing to inner carton



〔3〕 Shipping carton



〔4〕 Marking

(1) Reel marking

・Reel marking shall consist of :

1) Parts name
2) Quantity
3) Manufacturing date or symbol
4) Manufacturer’s date or symbol
5) Others (if necessary)

(2) Inner carton marking

・Same as reel marking.

(3) Shipping carton marking

・Shipping carton marking shall consist of :

1) Parts name
2) Quantity

〔5〕 Quantity

・1 000 pcs./reel

〔6〕 Storage environment

(1) To storage the reel at 15 °C to 35 °C, 25 %RH to 85 %RH of humidity.
(2) To open the packing just before using.
(3) Not to expose the sun.
(4) Not to storage with some erosive chemicals.
(5) Nothing is allowed to put on the reel or carton to prevent mechanical damage.

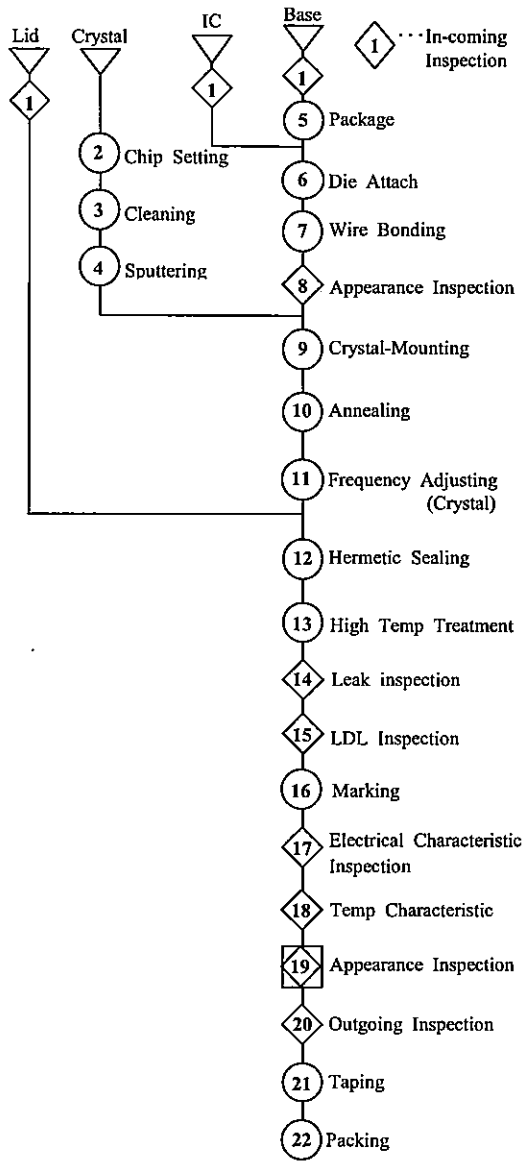
〔7〕 Handling

・To handle with care to prevent the damage of tape, reel and products.

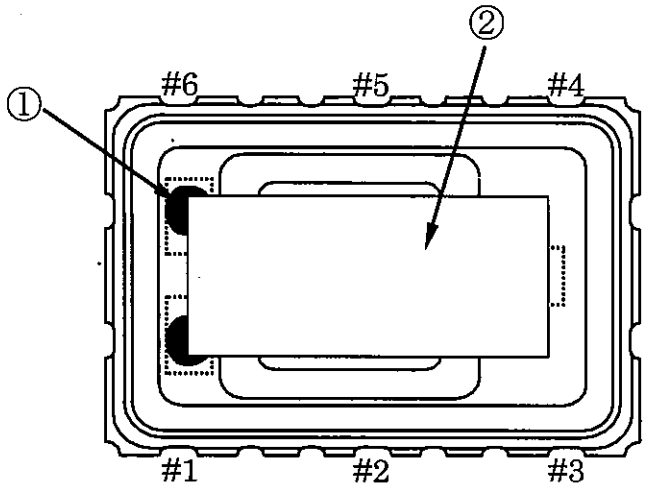
- PROCESS QUALITY CONTROL -

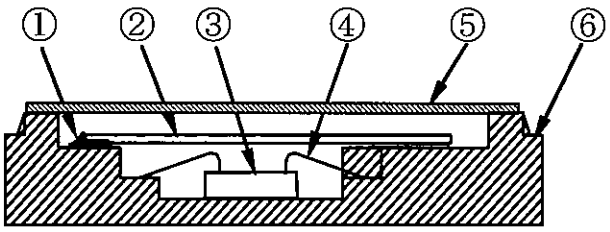
No. VG-4232CA - 00 - ASE – 1 CRYSTAL OSCILLATOR : VG−4232CA

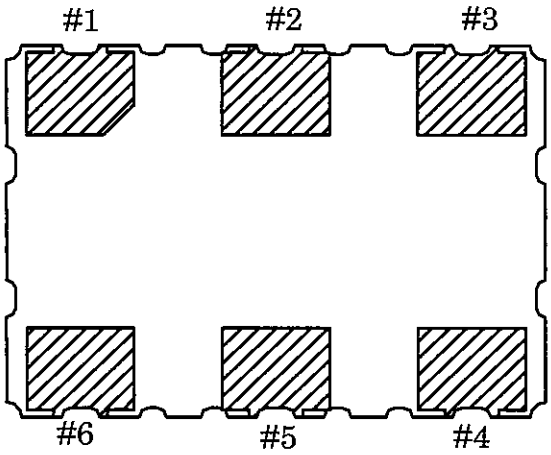
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Manufacturing process chart	No.	Section In Charge	Standards	Inspection, Control Item	Instruments	Inspection Methods	Record
	1	Inspection Section	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Microscope	Sampling	Data sheet
	2	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	100% Inspection	Data sheet
	3	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	4	China plant	Manufacturing Instruction Sheet	Appearance Frequency	Microscope	Sampling	Data sheet
	5	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	6	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	7	China plant	Manufacturing Instruction Sheet	Bonding strength Appearance	Pull tester/Gauge Microscope	Sampling 100% Inspection	Data sheet
	8	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	100% Inspection	Data sheet
	9	China plant	Manufacturing Instruction Sheet	Mounting strength Appearance	Pull tester Microscope	Sampling 100% Inspection	Data sheet
	10	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	—
	11	China plant	Manufacturing Instruction Sheet	Frequency	Counter	Sampling	Data sheet
	12	China plant	Manufacturing Instruction Sheet	Appearance Frequency	Microscope Counter	Sampling	Data sheet
	13	China plant	Manufacturing Instruction Sheet	—	—	—	—
	14	China plant	Manufacturing Instruction Sheet	Leakage inspection	Measuring equipment	100% Inspection	Data sheet
	15	China plant	Manufacturing Instruction Sheet	Characteristic inspection	Measuring equipment	100% Inspection	Data sheet
	16	China plant	Manufacturing Instruction Sheet	Appearance	Visual Inspection	Sampling	Data sheet
	17	China plant	Delivery Specifications Outgoing Inspection Standard	Electrical characteristic Master check	Measuring equipment	100% Inspection	Data sheet
	18	China plant	Manufacturing Instruction Sheet	Temp characteristic Inspection	Measuring equipment	100% Inspection	Data sheet
	19	China plant	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	20	China plant	Delivery Specifications Outgoing Inspection Standard	Electrical characteristic Appearance Master check	Measuring equipment Microscope	Sampling	Data sheet
	21	China plant	Manufacturing Instruction Sheet	Tape peeling strength Frequency check function	Peeling strength test machine	Sampling	Data sheet
	22	China plant	Manufacturing Instruction Sheet Daily Shipping List	Customers Type Quantity	—	—	Delivery Slip

Structure diagram VG-4232CA







LIST		
	Name of part	Material
①	Crystal Adhesive	Ag Paste
②	Crystal chip	AT cut
③	IC	C-MOS
	IC conductive adhesive	Ag Paste
④	Bonding wire	Au
⑤	Cap	Kovar
⑥	Package	Ceramic(Al_2O_2)

RELIABILITY TEST DATA

Product Name : VG-4232CA series

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . **No.DTA-1203E**

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST Qty [n]	FAIL Qty [n]
			Δ f / f *2 [1 × 10^{-6}]	Electrical characteristics		
1	High temperature bias	+85 ℃ × (Vcc/Vc Max.) bias × 1 000 h	*3 ± 15	Satisfy specification after test	22	0
2	Low temperature storage	-55 ℃ × 1 000 h	*3 ± 10		22	0
3	Temperature humidity	+85 ℃ × 85 %RH × 1 000 h	*3 ± 10		22	0
4	Temperature cycle	-55 ℃ ⇔ +125 ℃ 30 min at each temp. 100 cycles	*3 ± 10		22	0
5	Resistance to soldering heat	For convention reflow soldering furnace (3 times) IPC/JEDEC J-STD-020D.1	± 10		22	0
6	Vibration	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s^2 10 Hz → 500 Hz → 10 Hz 15 min / cycle 6 h (2 h × 3 directions)	± 5		22	0
7	Drop	Free dorop from 750 mm height on a hard Wooden board for 3 times	± 5		22	0
8	Air tight	He leakage detector	1 × 10^{-9} Pa･m^3/s Max.		11	0

Notes

1. *1 Each test done independently.
2. *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
3. *3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.(Reflow 3 times)

Qualification Data

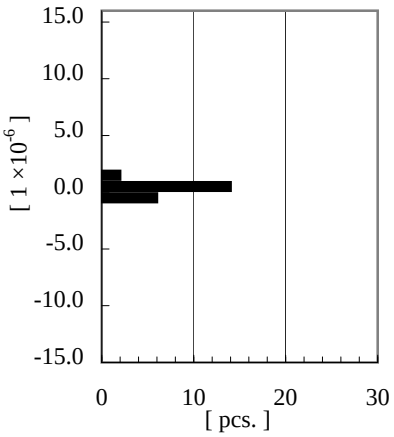
Product Name : VG-4232CA series

Δ f / f

No.DTA-1203E

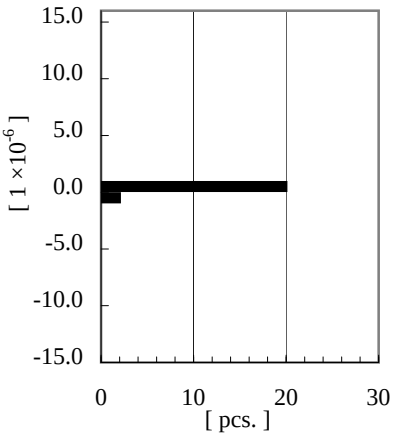
1. High temp. bias

+85 ℃ ×(Vcc/Vc Max.)×1 000 h



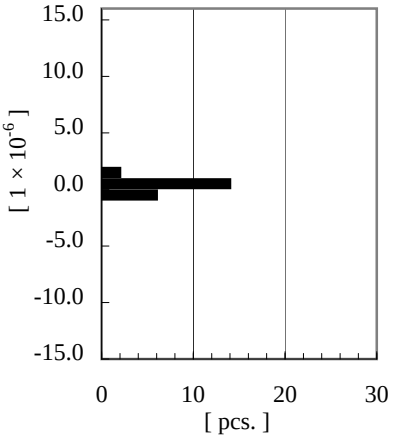
2. Low temp. storage

-55℃ × 1 000 h



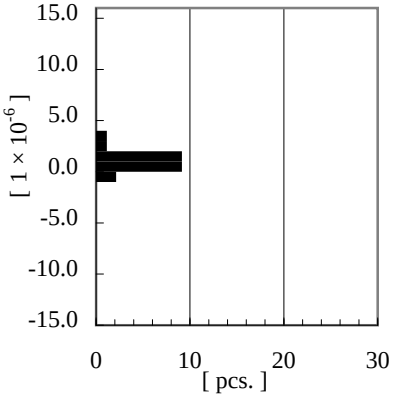
3. Temp. humidity

+85 ℃ × 85 %RH × 1 000 h



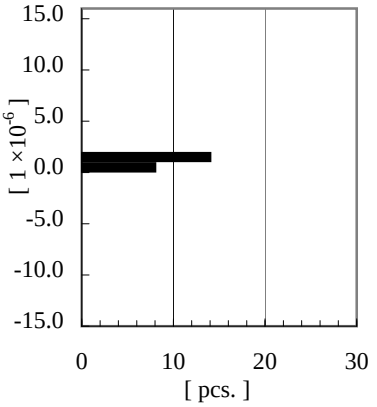
4. Temp. cycle

-55 ℃ ⇔ +125 ℃ 100 cycles



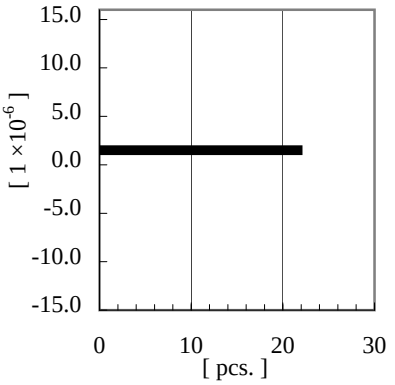
5.Resistance to soldering heat

For convention reflow soldering furnace
(3 times)



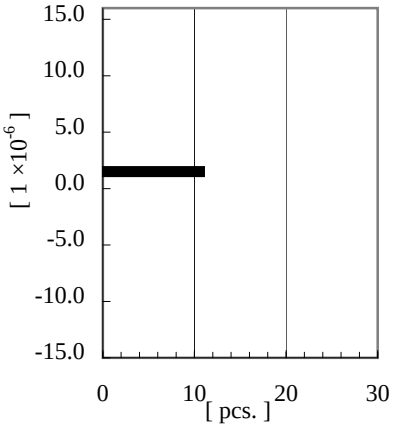
6. Vibration

10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz acceleration 98 m/s^2
15 min / cycle 6 h(2 h ×3 directions)



7. Drop

750mm × 3 times Free drop



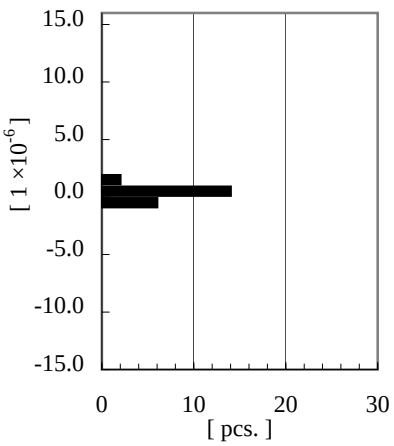
Qualification Data

製 品 名：VG-4232CA series

周波数変化率 (Δ f / f)　　**No.DTA-1203J**

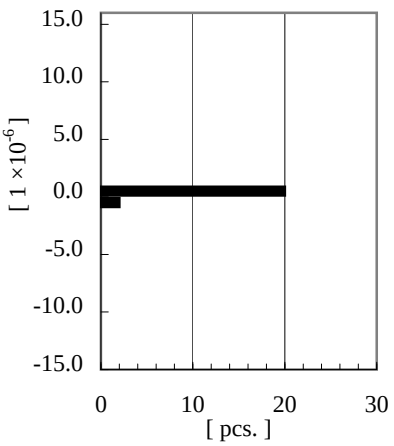
1. 高温ﾊﾞｲｱｽ試験

+85 ℃ ×(Vcc/Vc Max.)×1 000 h



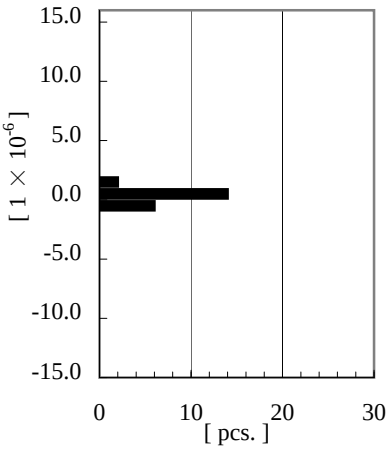
2. 低温保存試験

-55℃ × 1 000 h



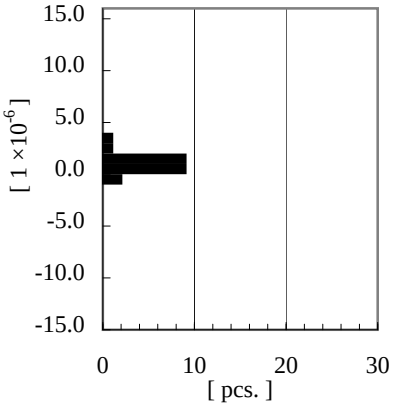
3. 高温高湿試験

+85 ℃ × 85 %RH × 1 000 h



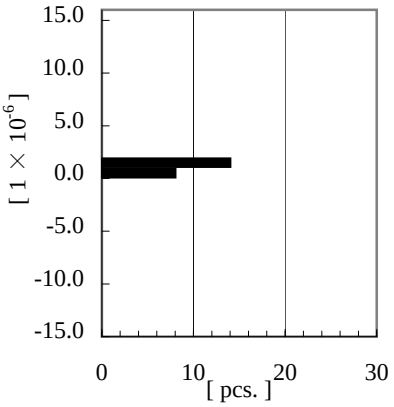
4. 温度サイクル試験

-55 ℃ ⇔ +125 ℃ 100 ｻｲｸﾙ



5. はんだ耐熱性試験

-40 ℃ ⇔ +125 ℃ 100 ｻｲｸﾙ

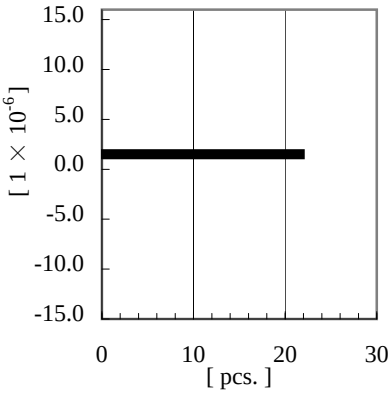


6. 振動試験

10 Hz ~ 55 Hz 振幅 0.75 mm

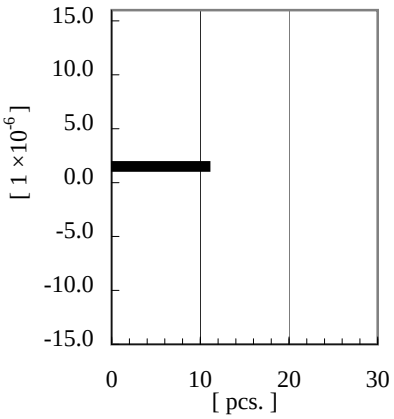
55 Hz ~ 500 Hz 加速度振幅 98 m/s^2

15 min / cycle 6 h (2 h × 3 方向)



7.落下試験

750 mm × 3回　自然落下



Qualification Data