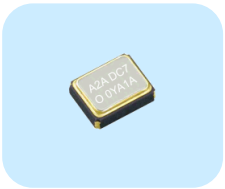
EPSON

Temperature Compensated Crystal Oscillator (TCXO)



Data sheet

MODEL : TG-5006CJ-47L 32.000000 MHz

Product. No. : X1G0041310042xx

Please refer to the 10.Packing information about xx (last 2 digits)

SEIKO EPSON CORPORATION

Pb free.	
Complies with EU RoHS directive. *About the products without the Pb-free mark. Contains Pb in products exempted by EU RoHS directive. (Contains Pb in sealing glass, high melting temperature type solder or other.)	

INTRODUCTION

1. Any part of this material may not be reproduced or duplicated in any form or any means without the written permission of Seiko Epson.
2. This sheet is not intended to guarantee or provide an approval of implementation of industrial patents.
3. The content of this document is subjects to change without notice.

[1] Characteristics

· Package size (2.0 mm×1.6 mm×0.73 mm)
· High stability TCXO
· Output waveform : Clipped sine wave
· Reference weight Typ.9.1mg

[2] Absolute maximum ratings

Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Supply voltage	Vcc-GND	-0.3	-	+4.0	V	-
Storage temperature range	T_stg	-40	-	+90	°C	Storage as single product

[3] Recommended operating conditions

Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Supply voltage	Vcc	2.85	3	3.15	V	-
	GND	0	-	0	V	-
Operating temperature range	T_use	-30	25	+85	°C	-
Output load	Load_R	9	10	11	kΩ	-
	Load_C	9	10	11	pF	DC cut capacitor = 0.01 µF
	Cc	0.01	-	-	µF	DC-cut capacitor *

* DC-cut capacitor is not included in this TCXO. Please attach an external DC-cut capacitor to the out pin.

[4] Frequency characteristics

(Vcc=3 V, GND=0.0 V, Load=10 kΩ // 10 pF, T_use=+25°C)

Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Output Frequency	fo	-	32	-	MHz	
Frequency tolerance	f_tol	-0.8	-	+0.8	x10^{-6}	T_use = +25 °C±2 °C Before reflow
Frequency tolerance *1	f_tol	-2.0	-	+2.0	x10^{-6}	T_use = +25 °C±2 °C After 2 reflows *2
Frequency / temperature characteristics	fo-Tc	-2.0	-	+2.0	x10^{-6}	T_use = -30 °C to +85 °C
Frequency / load coefficient	fo-Load	-0.2	-	+0.2	x10^{-6}	10 kΩ // 10 pF ± 10 %
Frequency / voltage coefficient	fo-Vcc	-0.2	-	+0.2	x10^{-6}	Vcc ± 5 %
Frequency aging	f_age	-1.0	-	+1.0	x10^{-6}	1st year, T_use=25°C
		-	-	-	x10^{-6}	-

*1 Include initial frequency tolerance and frequency deviation after reflow cycles.
*2 Measured in the elapse of 24 hours after reflow soldering.
*3 Vcc ± 5% must be in operating supply voltage range (2.85 V to 3.15 V)

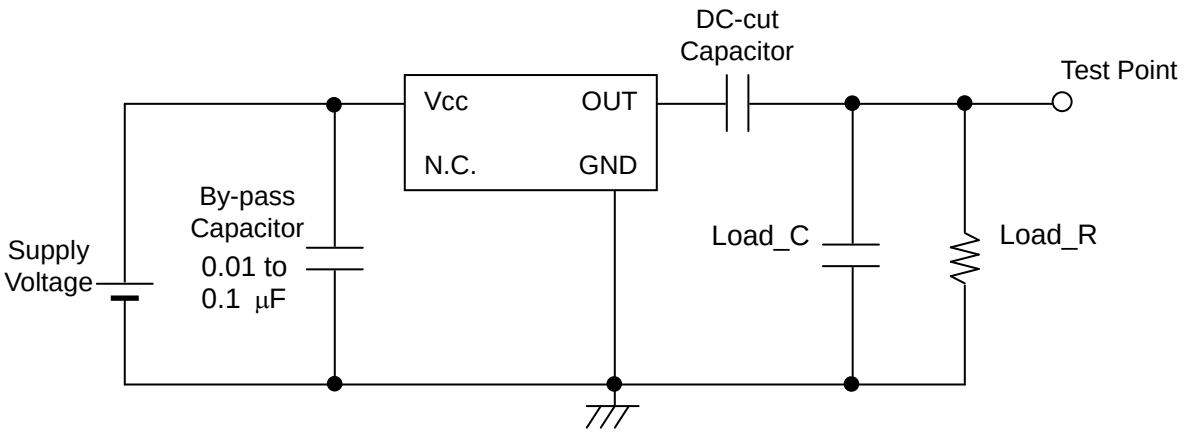
[5] Electrical characteristics

(Vcc=3 V, GND=0.0 V, Load=10 kΩ // 10 pF, T_use=+25°C)

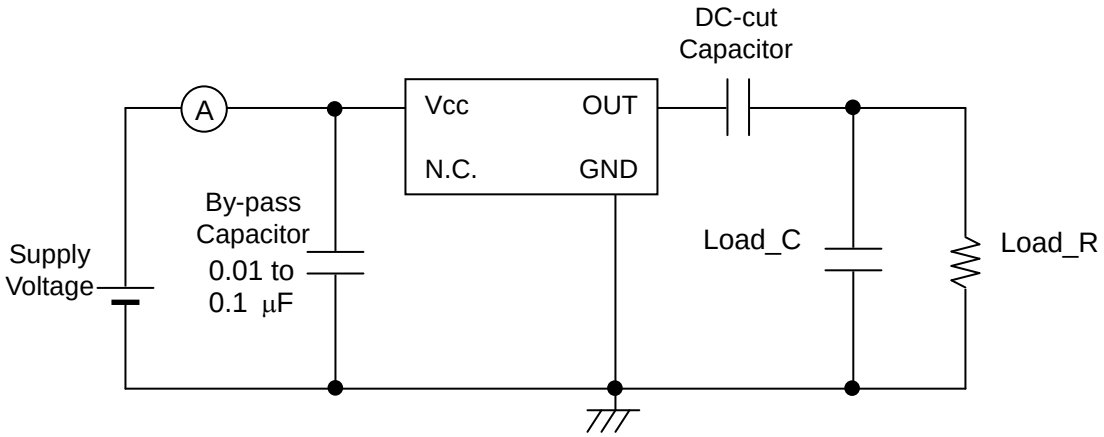
Parameter	Symbol	Specifications			Unit	Conditions
		Min.	Typ.	Max.		
Current consumption	Icc	-	-	2.0	mA	T_Use = +25°C , 10 kΩ//10pF
Output level	Vp-p	0.8	-	1.5	V	Peak to peak 10 kΩ//10pF ± 10%
Symmetry	SYM	40	-	60	%	GND Level
Start up time	t_sta	-	-	2.0	ms	Within 90% of final amp.
		-	-	2.0	ms	ΔF = ± 1.0 x 10-6
Harmonics	-	-	-	-8.0	dBc	-
Phase noise	L(f)	-	-	-	dBc/Hz	-
		-	-	-82		10Hz offset
		-	-	-108		100Hz offset
		-	-	-130		1kHz offset
		-	-	-145		10kHz offset
		-	-	-148		100kHz offset
		-	-	-148		1MHz offset

[6] Test circuit

1) Output Load : Load_R // Load_C = 10 kΩ // 10 pF



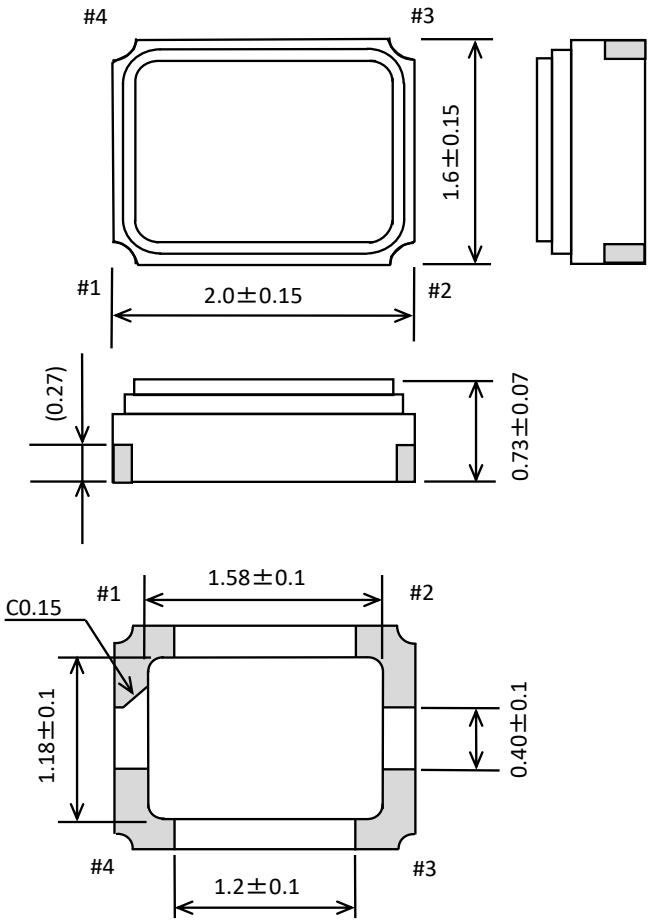
2) Current consumption



3) Conditions

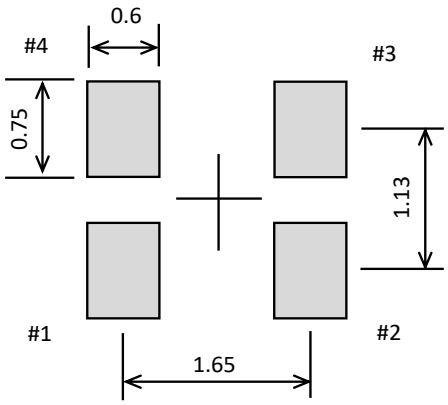
1. Oscilloscope: Impedance Min. 1MΩ
   Input capacitance Max. 10 pF
   Band width Min. 300 MHz
   Impossible to measure both frequency and wave form at the same time.
   (In case of using oscilloscope's amplifier output, possible to measure both at the same time.)
2. Load_C includes probe capacitance.
3. A capacitor (By-pass:0.01 μF to 0.1 μF) is placed between Vcc and GND,and closely to TCXO.
4. Use the current meter whose internal impedance value is small.
5. Power Supply
   Impedance of power supply should be as low as possible.
6. GND pin should be connected to low impedance GND.

[7] Outline drawing unit:mm



Material
Ceramics(Cavity)
Au plated nickel(Electric terminal)
Fe-Ni-Co(Lid)

[8] Recommended foot print unit:mm

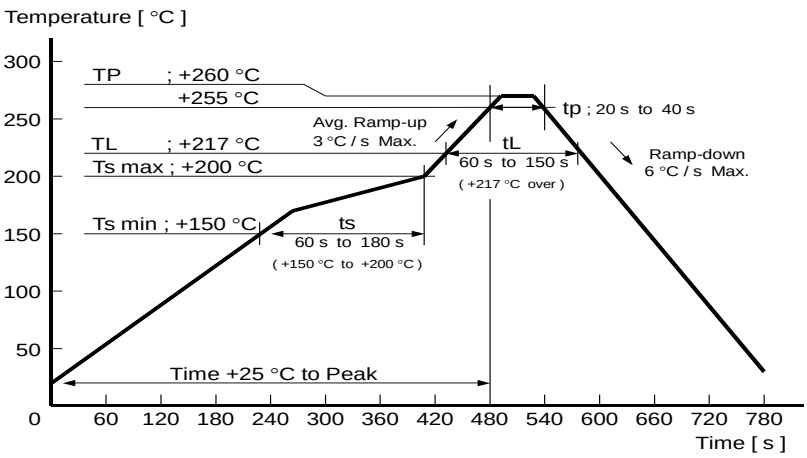


Pin #	Connection
1	N.C.
2	GND
3	OUT
4	Vcc

Do not connect “N.C.” pin with any other leads (also mutually)

To maintain stable operation, provide a 0.01 to 0.1 µF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc - GND).

[9] Reflow profile



[10] Packing information

1) Product number last 2 digits code(xx) description. The recommended code is "25"

Code	Condition	Reel diameter (mm)
01	Vinyl Bag (Bulk)	-
11	Any Q'ty / Reel	*1
12	250pcs / Reel	Φ180
14	1000pcs / Reel	
15	2000pcs / Reel	
16	3000pcs / Reel	
25	12000pcs / Reel	Φ330

*1 For orders of 3 000 or less, the reel diameter is Φ180 mm.
The reel diameter for more than 3 000 pieces is Φ330 mm.

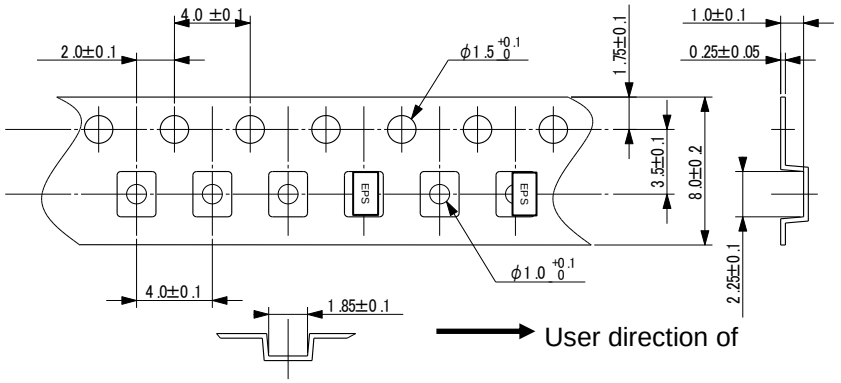
2) Taping specification

Subject to EIA-481, IEC-60286, JIS C0806

(1) Tape dimensions TE0804L

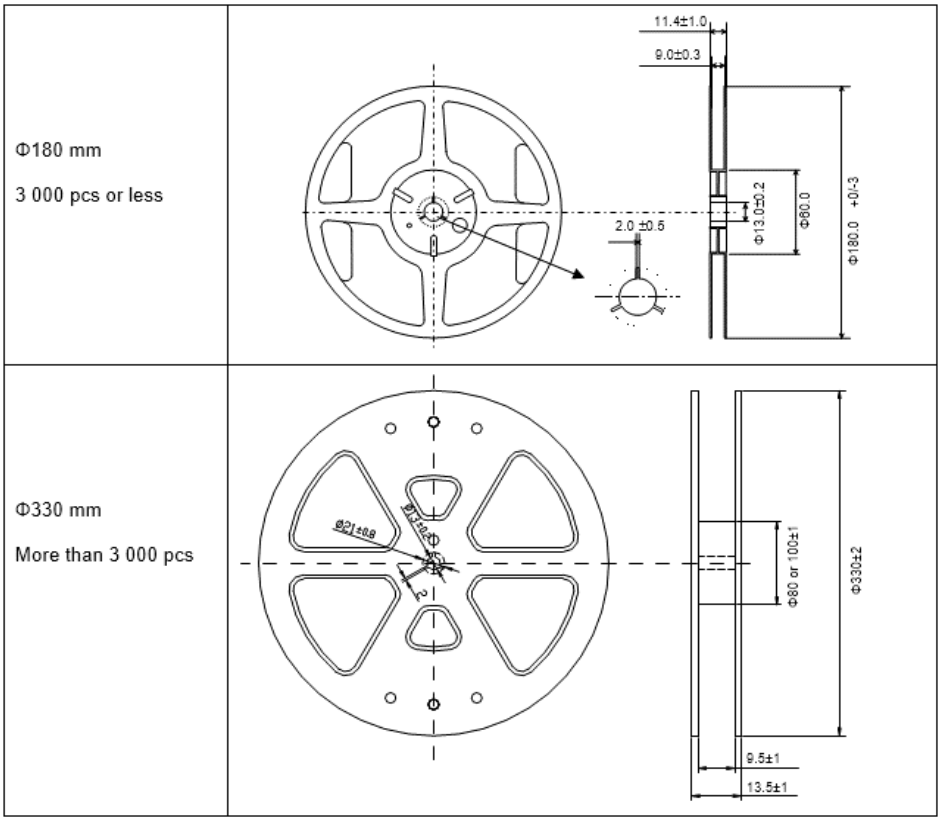
Material of the Carrier Tape : PS

Material of the Top Tape : PET + PE unit: mm



(2) Reel dimensions

Material of the Reel : PS unit: mm



Form and Size of reel window shows are one of the example

[11] Handling precautions

Prior to using this product, please carefully read the section entitled “Precautions” on our Web site (https://www5.epsondevice.com/en/information/#precaution) for instructions on how to handle and use the product properly to ensure optimal performance of the product in your equipment.
Before using the product under any conditions other than those specified therein, please consult with us to verify and confirm that the performance of the product will not be negatively affected by use under such conditions.
In addition to the foregoing precautions, in order to avoid the deteriorating performance of the product, we strongly recommend that you DO NOT use the product under ANY of the following conditions:

(1) Do not expose this product to excessive mechanical shock or vibration.
(2) This product can be damaged by mechancial shock during the soldering process depending on the equipment used, process conditions, and any impact forces experienced. Always follow appropriate procedures, particularly when changing the assembly process in anyway and be sure to follow applicable process qualification standards before starting production.
(3) These devices are sensitive to ESD, please use appropriate precautions during handling, assembly, test, shipment, and installation.
(4) This product contains semiconductor content that should not be exposed to electromagnetic waves.
(5) The use of ultrasonic technology for cleaning, bonding, etc. can damage the Xtal unit inside this product. Please carefully check for this consideration before using ultrasonic equipment for volume production with this product.
(6) Noise and ripple on the power supply may have undesirable affects on operation and cause degradation of phase noise characteristics. Evaluate the operation of this device with appropriate power supplies carefully before use.
(7) When applying power, ensure that the supply voltage increases monotonically for proper operation. On power doen, do not reapply power until the supplies, bypass capacitors, and any bulk capacitors are completely discharged since that may cause the unit to malfunction.
(8) Aging specifications are estimated from environmental reliability tests and expected frequency variation over time. They do not provide a guarantee of aging over the product lifecycle.
(9) Aging stability is estimated from environmental reliability tests; expected amount of the frequency variation. This does not intend to guarantee the product-life cycle.
(9) The metal cap on top of the device is directly connected to the GND terminal (pin #2). Take necessary precautions to prevent any conductor not at ground potential from contacting the cap as that could cause a short circuit to GND.
(10)Do not route any signal lines, supply voltage lines, or GND lines underneath the area where the oscillators are mounted including any internal layers and on the opposite side of the PCB. To avoid any issues due to interference of other signal lines, please take care not to place signal lines near the product as this may have an adverse affect on the performance of the product.
(11)A bypass capacitor of the recommended value(s) must be connected between the Vcc and GND terminals of the product. Whenever possible, mount the capacitor(s) on the same side of the PCB and as close to the product as possible to keep the routing traces short.
(12)Power supply connections to Vcc and GND pins should be routed as thick as possible whle keeping the high frequency impedance low in order to get the best performance.
(13) The use of a filter or similar element in series with the power supply connections to protect from electromagnetic radiation noise may increase the high frequency impedance of the power supply line and may cause the oscillator to not operate properly. Please verify the design to ensure sufficient operational margin prior to use.
(14) Keep PCB routing from the output terminal(s) to the load as short as possible for best performance.
(15) Do not short the output to GND as that will damage the product. Always use with an appropriate load resistor connected.
(16) Product failures during the warranty period only apply when the product is used according to the recommended operating conditions described in the specifications. Products that have been opened for analysis or damaged will not be covered. It is recommended to store and use in normal temperature and humidity environments described in the specifications to ensure frequency accuracy and prevent moisture condensation. If the product is stored for more than one year, please confirm the pin solderability prior to use.
(17) If the oscillation circuit is exposed to condensation, the frequency may change or oscillation may stop. Do not use in any conditions where condensation occurs.
(18) Do not store or use the product in an environment where it can be exposed to chemical substances that are corrosive to metal or plastics such as salt water, organic solvents, chemical gasses, etc. Do not use the product when it is exposed to sunlight, dust, corrosive gasses, or other materials for long periods of time.
(19) When using water-soluble solder flux make sure to completely remove the flux residue after soldering. Pay particular attention when the residues contain active halogens which will negatively affect the product and its performance.
(20) Do not touch the surface of the IC with tweezers or other hard tools.

(21) Do not use adhesives with this product as this will cause the oscillation to stop if the IC is damaged by adhesive. This product uses an underfill material on the bottom side of package where adhesive near the bottom side may cause the TCXO to be damaged by thermal expansion.

Should any customer use the product in any manner contrary to the precautions and/or advice herein, such use shall be done at the customer’s own risk.

NOTICE: PLEASE READ CAREFULLY BELOW BEFORE THE USE OF THIS DOCUMENT

1. The content of this document is subject to change without notice. Before purchasing or using Epson products, please contact with sales representative of Seiko Epson Corporation ("Epson") for the latest information and be always sure to check the latest information published on Epson's official web sites and resources.
2. This document may not be copied, reproduced, or used for any other purposes, in whole or in part, without Epson's prior consent.
3. Information provided in this document including, but not limited to application circuits, programs and usage, is for reference purpose only. Epson makes no guarantees against any infringements or damages to any third parties' intellectual property rights or any other rights resulting from the information. This document does not grant you any licenses, any intellectual property rights or any other rights with respect to Epson products owned by Epson or any third parties.
4. Epson has prepared this document carefully to be accurate and dependable, but I accurate and complete. Epson assumes no responsibility for any damages you incurred due to any misinformation in this document.
5. Epson products listed in this document and our associated technologies shall not be used in any equipment or systems that laws and regulations in Japan or any other countries prohibit to manufacture, use or sell. Furthermore, Epson products and our associated technologies shall not be used for the purposes of military weapons development (e.g. mass destruction weapons), military use, or any other military applications. If exporting Epson products or our associated technologies, please be sure to comply with the Foreign Exchange and Foreign Trade Control Act in Japan, Export Administration Regulations in the U.S.A (EAR) and other export-related laws and regulations in Japan and any other countries and to follow their required procedures.
6. Epson assumes no responsibility for any damages (whether direct or indirect) caused by or in relation with your non-compliance with the terms and conditions in this document or for any damages (whether direct or indirect) incurred by any third party that you give, transfer or assign Epson products.
7. For more details or other concerns about this document, please contact our sales representative.
8. Company names and product names listed in this document are trademarks or registered trademarks of their respective companies.

●Disclaimer

1. Epson products are designed for use in general electronic equipment applications that do not require extremely high reliability or safety.

2. Epson does not represent or warrant that its products will not cause a failure for any particular application, except for cases where the failure is a direct result caused by defects in materials and workmanship of this product.
   If a product fails due to defects in materials and workmanship, to the maximum extent permitted by law, we will, at our sole discretion, refund or replace the affected product.

3. When products for used directly or indirectly in certain devices or applications (ex. Nuclear power, aerospace, infrastructure facilities, medical equipment, etc.) which are connected to or affect safety of human life or property, Customer is solely responsible for determining if the products and respective specifications are suitable for the intended use in particular customer applications.
   Customer shall implement necessary and proper safety design and measures (including redundant design, malfunction prevention design, etc.) to ensure reliability and safety before using the products in/with customer's Equipment.

4. No dismantling, analysis, reverse engineering, modification, alteration, adaptation, reproduction, etc., of Epson products is allowed. Furthermore, any defects caused by this are not covered by the warranty.