Contents

1. Introduction

This userguide provides the device on how to appropriately verify the performance of QST's QTO107 series OCXOs. The evaluation board (EVB) is designed to provide a convenient and robust test bench for measurement of SMD OCXO.

2. How to use evaluation board

The top view of the EVB and related key parts are shown in Figure 1, including socket, VCC, GND, and VC port, a probe pin (H1), 3 SMA connectors (P1, P2 and P3), and other active and passive components.

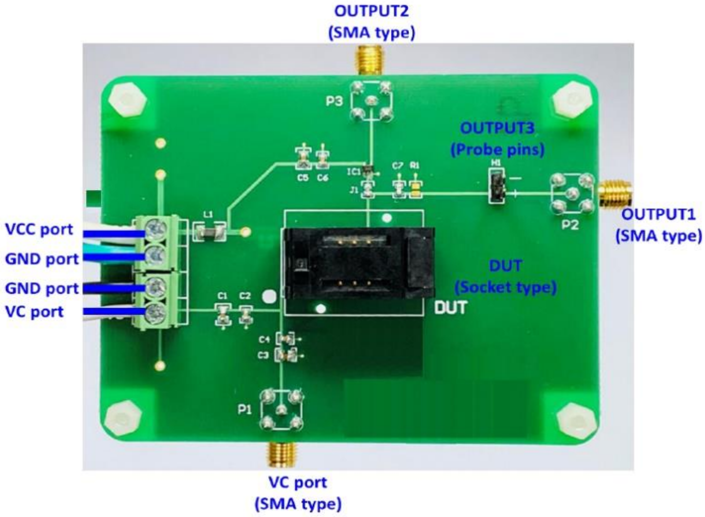


Figure 1 – Top view of the evaluation board

User can follow recommended equipment to verify OCXO listed below :

a. Recommended equipment

1.	DC power supply	Agilent	E3631A
2.	Frequency counter	Agilent	53132A
3.	Active probe	Agilent	2793A
4.	Digital multimeter	Agilent	34401A
5.	Oscilloscope	Agilent	54610B
6.	Signal spectrum analyzer	Agilent	E5052B
7.	Temperature chamber	Saunders & Association	4350
8.	Rubidium clock	Stanford Research Systems	FS725

b. Evaluation board circuit schematic

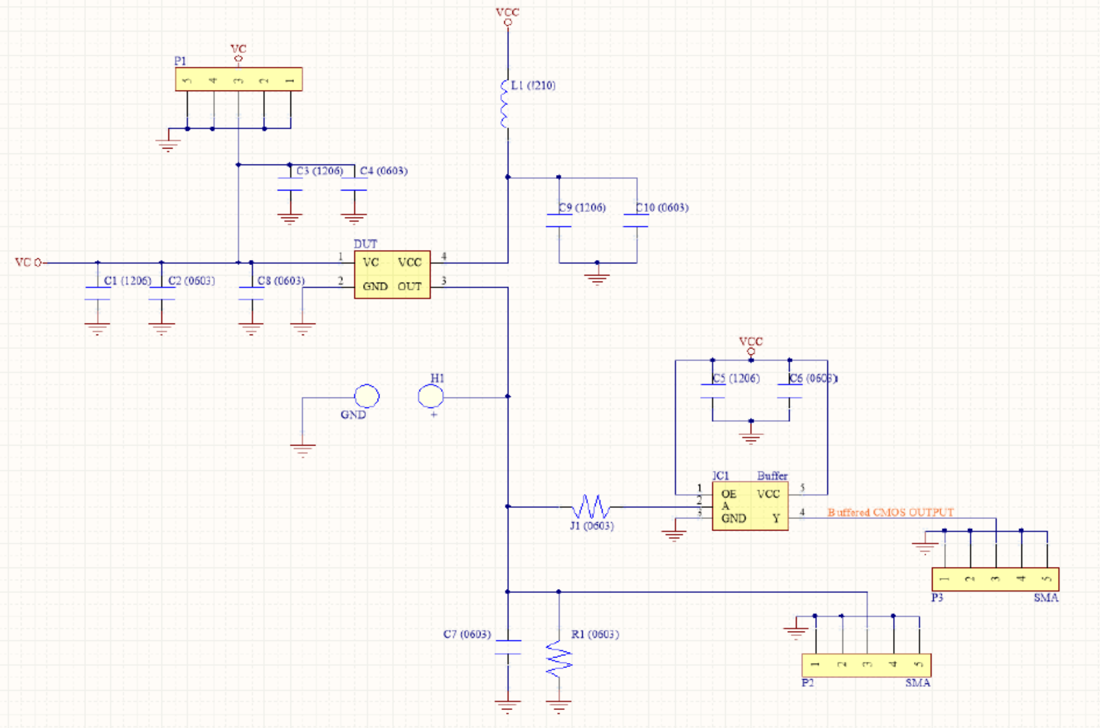
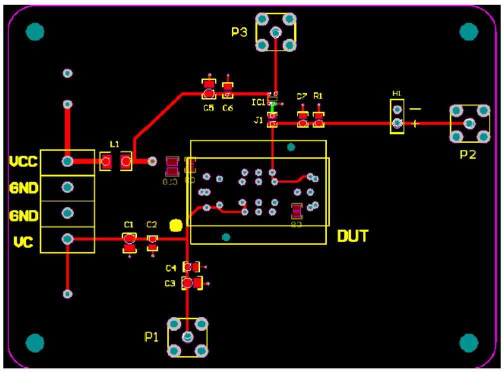


Figure 2 – OCXO EVB circuit

c. Evaluation board layout

(i)



(ii)

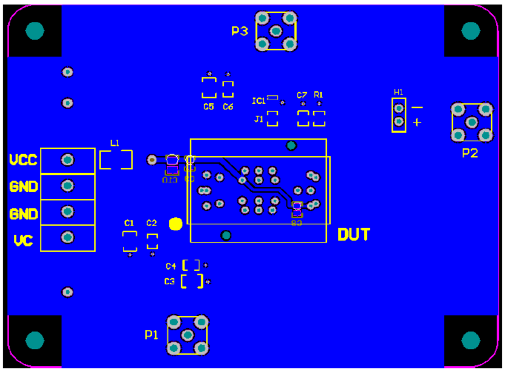


Figure 3 – The layout of OCXO EVB (i) top & (ii) bottom layer

d. Power supply function

Connect the VCC and GND cables from VCC and GND ports to the DC power supply as seen in Figure 1.

e. Control voltage function (optional for VC-OCXO)

As shown in Figure 4, the EVB provides two methods to apply VC voltage including [I] direct connection from VC port, and [II] connection from SMA connector (P1) to the DC power source.
Note: If there is no voltage control function of the OCXO, do not connect to any

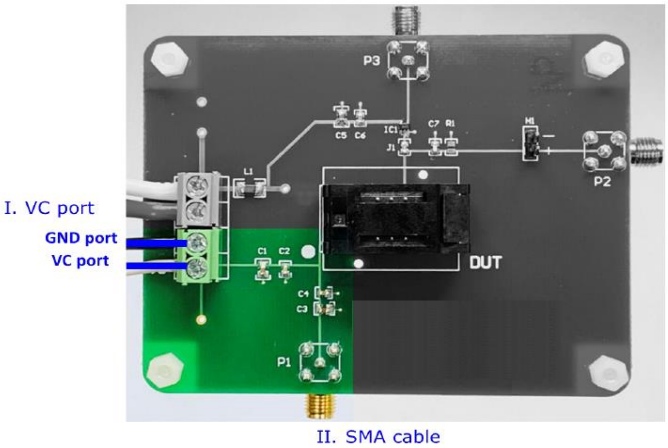


Figure 4 – VC connection by [I] VC port and [II] SMA connector

f. Signal output function

The EVB provides two methods to output signal including [I] directly output by an active probe at probe pins, and [II] buffered output by SMA connector as described

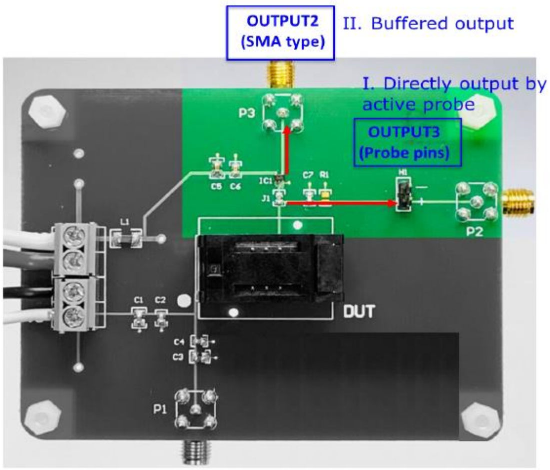


Figure 5 – Output connectoions by [I] active probe and [II] buffered output by SMA

[I] Directly output by an active probe
For this configuration as seen in Figure 5, the user can directly output the signal by an active probe and measure OCXO's frequency and waveform.

[II] Buffered output by SMA connector
For this configuration as seen in Figure 5, the user can buffered output by SMA connector and measure OCXO's temperature stability.

g. Notice
   (i) For all measurement, the frequenc-based instruments are locked by the rubidium cl
   (ii) For phase noise measurment, the DC block is necessary.
   Note: Min circuits - BLK-89 DC Blocks for the phase noise measurement.

3. Bill of materials list

Item	Description	Type	Size	QTY
IC	buffer	NC7SZ126	SC70	1
L1	ferrite beads	-	1210	1
C1	capacitor	1µF	1206	1
C2	capacitor	100nF	0603	1
C3	capacitor	1µF	1206	1
C4	capacitor	100nF	0603	1
C5	capacitor	1µF	1206	1
C6	capacitor	100nF	0603	1
C7	capacitor	10pF	0603	1
C8	capacitor	100nF	0603	1
C9	capacitor	1µF	1206	1
C10	capacitor	100nF	0603	1
J1	jumper	0ohm	0603	1
H1	for output probe	Header	NA	1
P1	for VC port by SMA cable	SMA	NA	1
P2	for OUTPUT1	SMA	NA	1
P3	for buffered output (OUTPU2)	SMA	NA	1

4. Electrical test

a. Frequency and waveform

As seen in Figure 6, for an appropriate evaluation on frequency accuracy and waveform measurement it is recommended to connect from OUTPUT3 (H1) with an active probe to a counter by considering a specified load as stated in the specification as the load was used for the evaluation of the device in production.

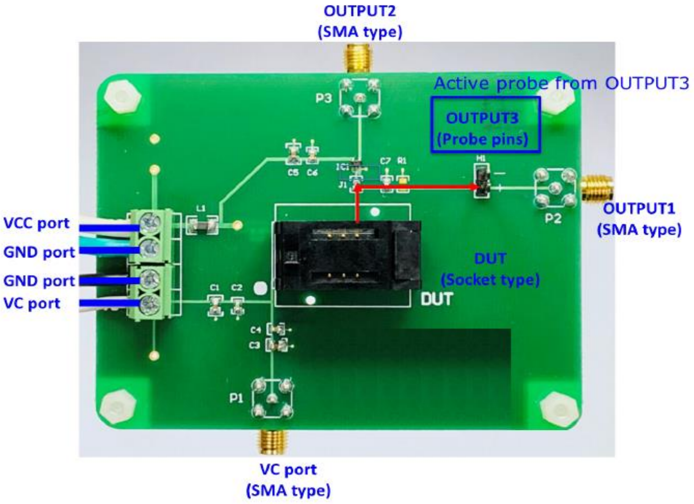


Figure 6 – Frequency and waverform measurement

b. Temeperature stability

For an appropriate evaluation of temperature stability, it is recommended to load the output with the load as stated in the specification as the load was used for the evaluation of the device in production. As seen in Figure 7, if there is any unwanted load acting on OCXO (e.g., additional load from SMA cable that is temperature dependance), the additional frequency deviation due to extra load change may be equivalent to the temperature stability (see Figure 8, OUTPUT1). to this end, there are two recommended methods to evaluate the temperature stability, [I] directly using the buffered out by connecting the SMA connector from the OUTPUT2 (P3) to a counter; and [II] using an active probe from the OUTPUT3 (H1) to a counter as seen in Figure 8. It should be aware of checking the capability of active probe on the operating temperature.

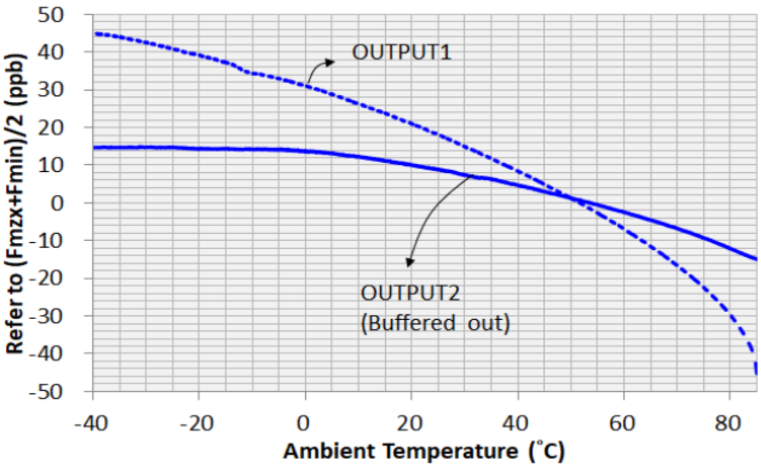


Figure 7 – Temperature stability comparison between buffered output (OUTPUT2)

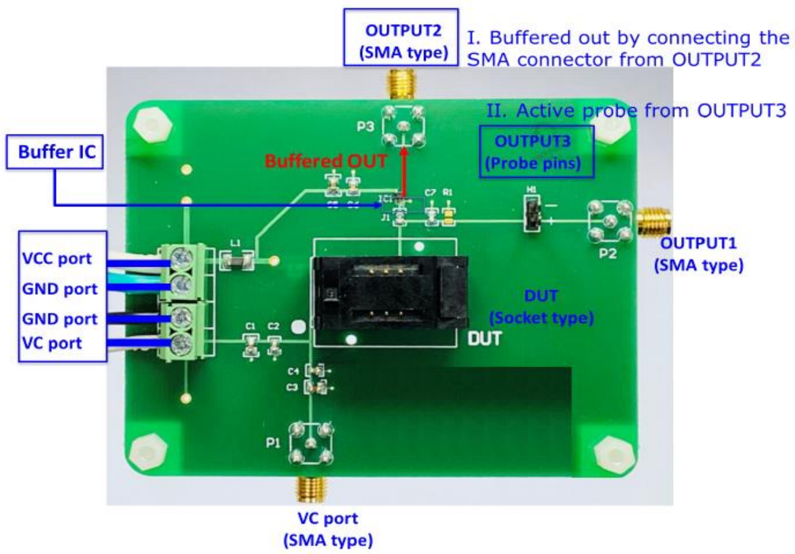


Figure 8 – Output connections by [I] directly using buffered out from OUTPUT2 (P3)

c. Phase noise

For an appropriate evaluation of phase noise performance, it is recommended to directly connect the OUTPUT1 SMA female (P2) to a phase noise analyzer with a DC block. It should be noted that an additional cable between OUTPUT1 to the signal spectrum analyzer may degrade the phase noise performance.
If the OCXO is considered a VC function, please use the VC port (P1) to connect to a low noise DC source (e.g., an embedded DC source by the signal spectrum analyzer, such as Agilent E5052B) as illustrated in Figure 9. As shown in Figure 10, the phase noise comparison between the DC source from Agilent E5052B signal spectrum analyzer and an Agilent E3631A power supply shows the importance of low noise DC sc

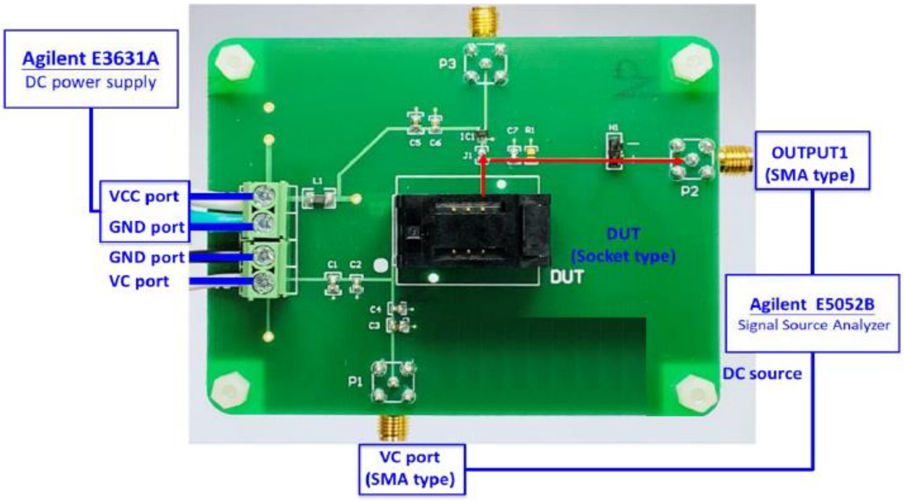


Figure 9 – Connections of phase noise measurement by using DC source from Agilent E5052B.

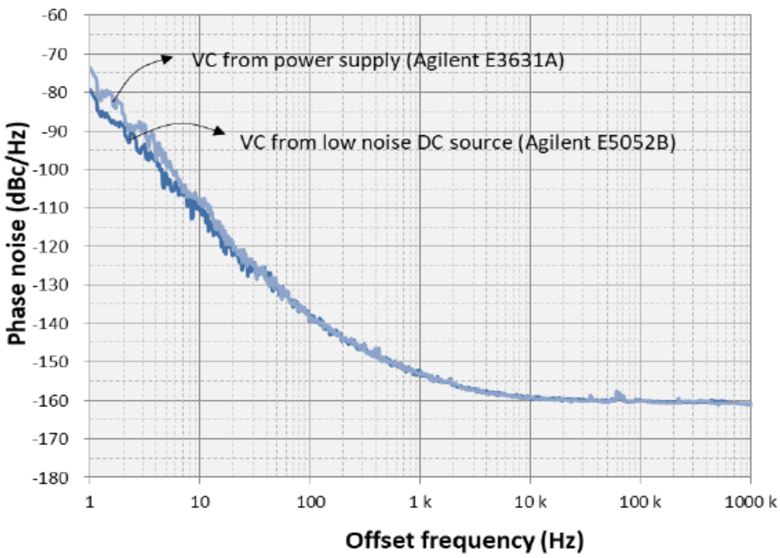


Figure 10
Comparison of phase noise measurement using different DC source from the signal spectrum analyzer (Agilent E5052B) and the power supply (Agilent E3631A)