

**ON Semiconductor®**



**APPLICATION NOTE AND9317/D**

**AX5043**

---

**Use with a TCXO Reference  
Clock**

Revision 2



## Table of Contents

<b>1. Introduction.....</b>	<b>3</b>
<b>2. Connection of Clipped Sine Wave TCXOs .....</b>	<b>4</b>
<b>3. Connection of CMOS TCXOs .....</b>	<b>6</b>



## 1. Introduction

This application note describes how to design an optimal connection between different TCXO types and AX5043.

If this connection is not designed in an optimal way, the AX5043 RF Synthesizer may produce higher phase noise than necessary, resulting in reduced selectivity in RX and lower attainable output power for a given regulatory regime in TX.



## 2. Connection of Clipped Sine Wave TCXOs

For TCXOs having clipped sine wave outputs an external circuitry consisting of two capacitors C1 and C2 as well as a resistor R are recommended. Component sizes as well as register settings are given in the tables.

The voltage at node  $V_p$  should be the TCXO output signal without significant additional distortion. The voltage at  $V_n$  should be a DC value equivalent to the mean value of the waveform at  $V_p$ .

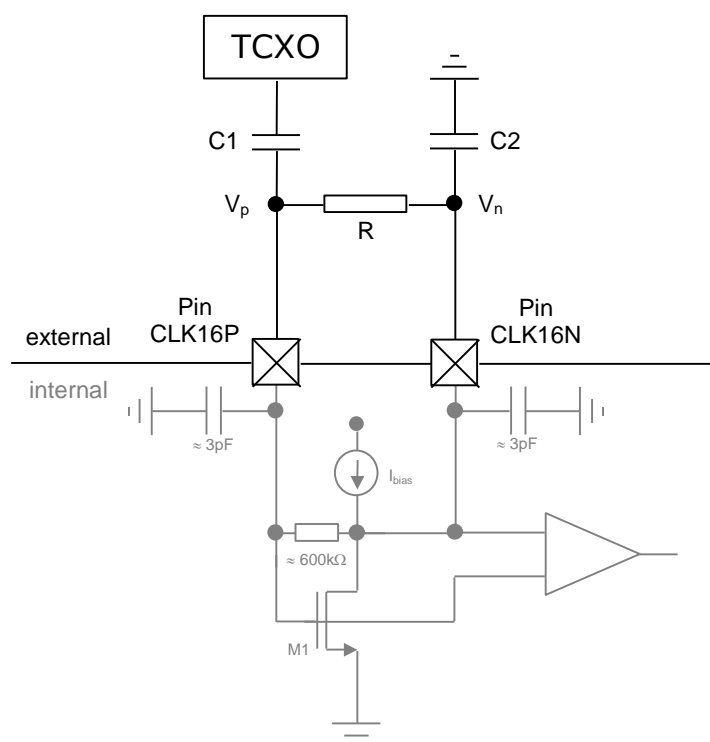


Figure 1 Configuration for a clipped sine wave output TCXO

Component	C1	C2	R
Value	1 nF	1 nF	1 kΩ

Table 1 Component values

Register	Analog Parameter	Value
0xF10	$I_{bias}$	0x04
0xF11	$I_{bias}$ autoreg.	0x00
0x184	XTALCAP	0x00

Table 2 Register settings

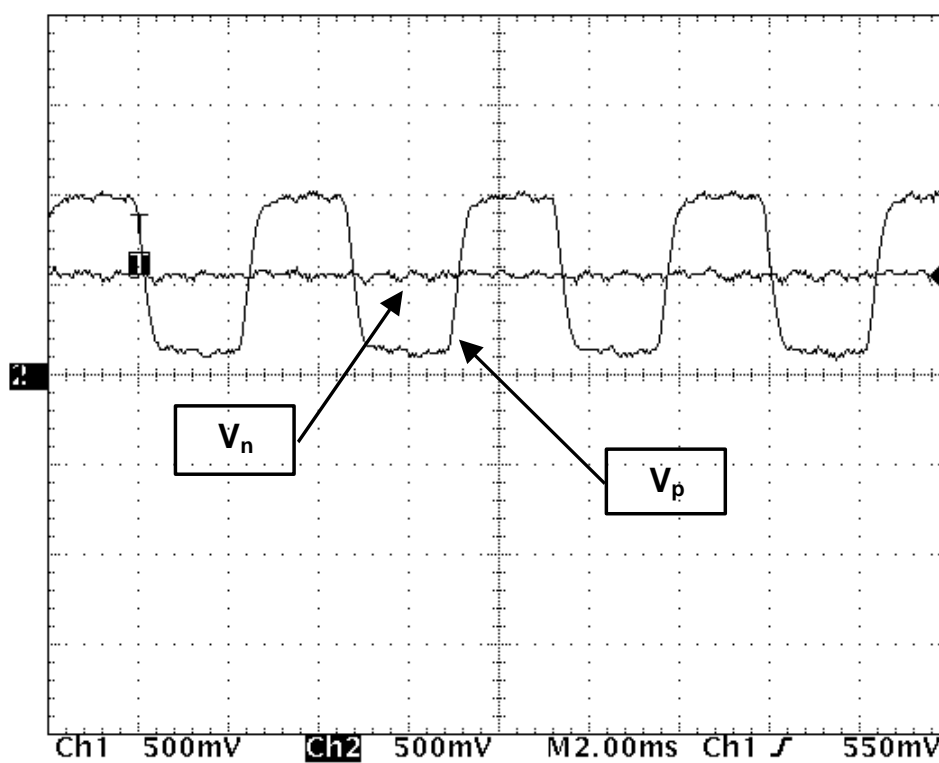


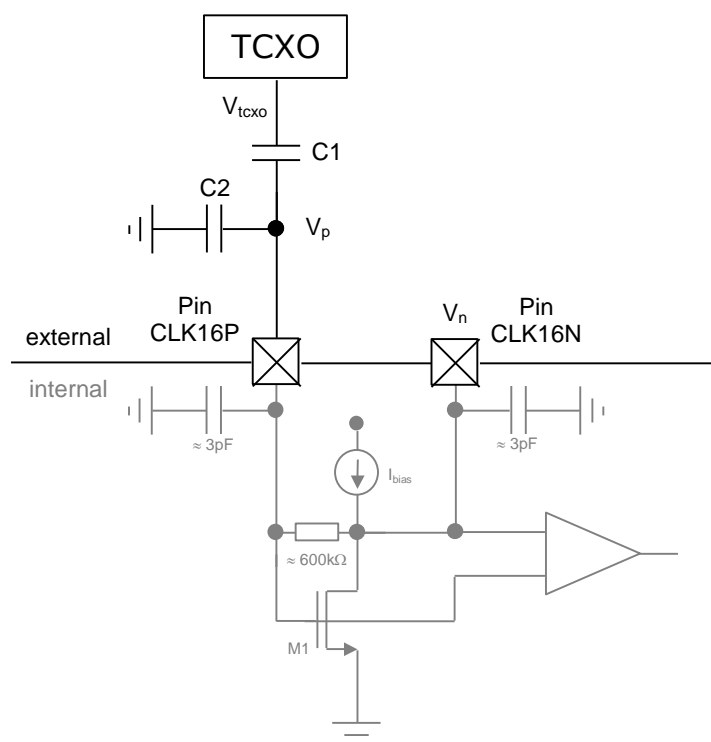
Figure 2 Voltages at nodes  $V_p$  and  $V_n$



### 3. Connection of CMOS TCXOs

For TCXOs having CMOS outputs it is recommended to use a capacitive divider (C1 and C2) to reduce the signal swing at the input pin CLK16P to between 1.5-2V peak-to-peak. Pin CLK16N should be left open, to allow the internal circuitry to work as a fast inverter. Component sizes as well as register settings are given in the tables.

The voltage at  $V_p$  should be the TCXO output signal without significant additional distortion and with a peak-to-peak swing no larger than 2V. The voltage at  $V_n$  should be the inverted waveform.



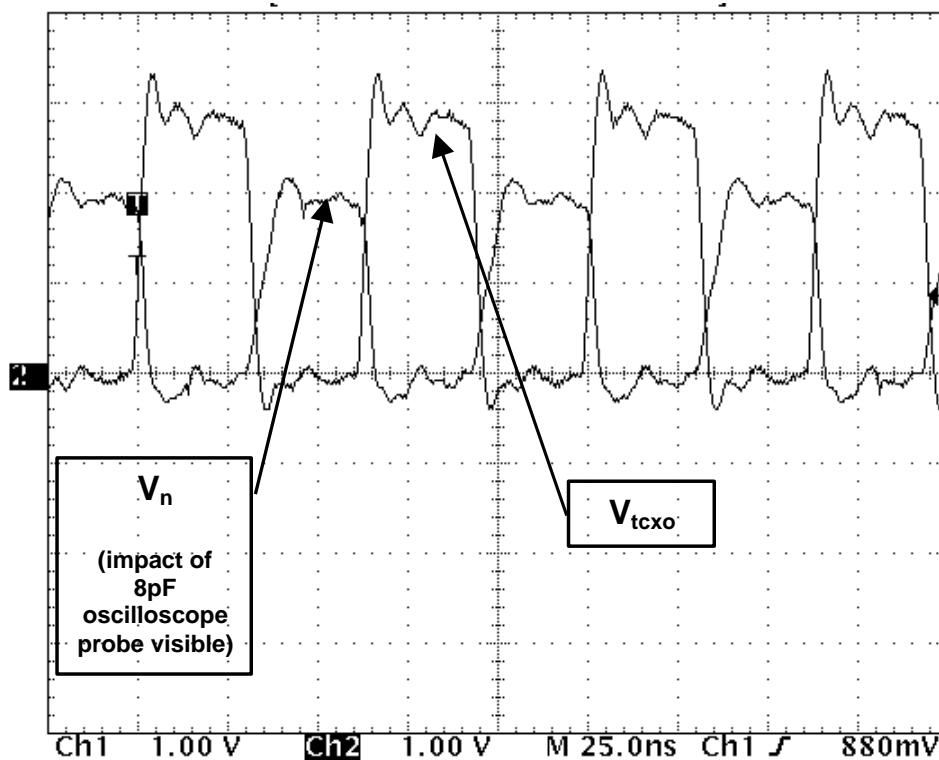
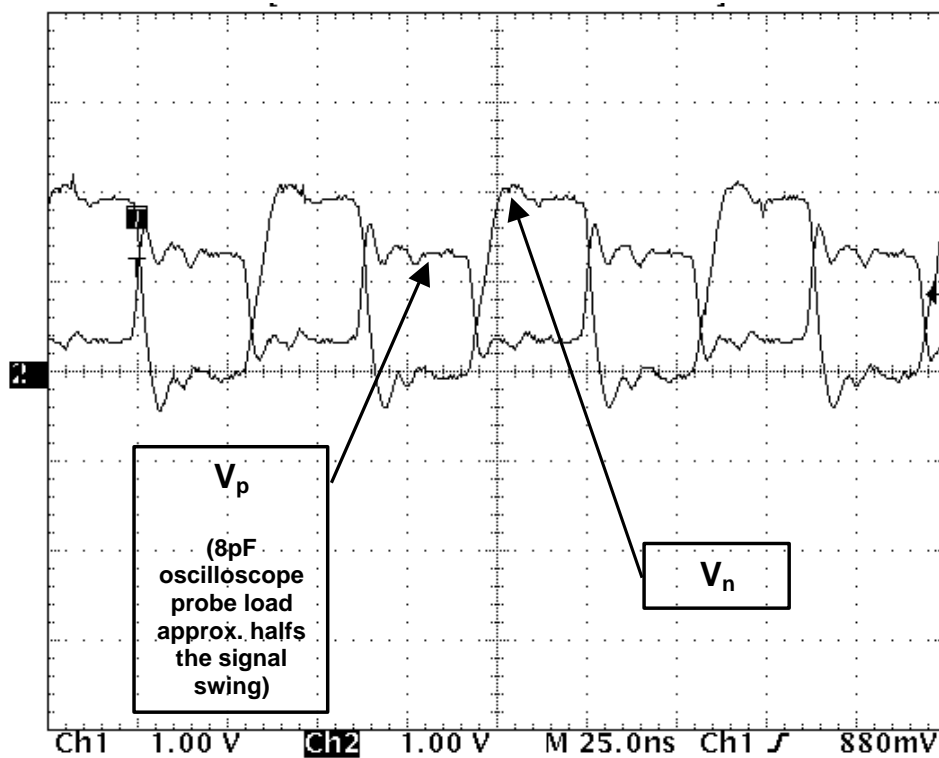
**Figure 3 Configuration for a clipped sine wave output TCXO**

Component	C1	C2
Value	10 pF	6.8 pF


**Table 3 Component values**

Register	Analog Parameter	Value
0xF10	$I_{bias}$	0x0F
0xF11	$I_{bias}$ autoreg.	0x00
0x184	XTALCAP	0x00

Table 4 Register settings

Figure 4 Voltages at nodes  $V_{tcxo}$  and  $V_n$ Figure 5 Voltages at nodes  $V_p$  and  $V_n$



ON Semiconductor and the  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries. SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### PUBLICATION ORDERING INFORMATION

##### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada

Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910

Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local  
Sales Representative