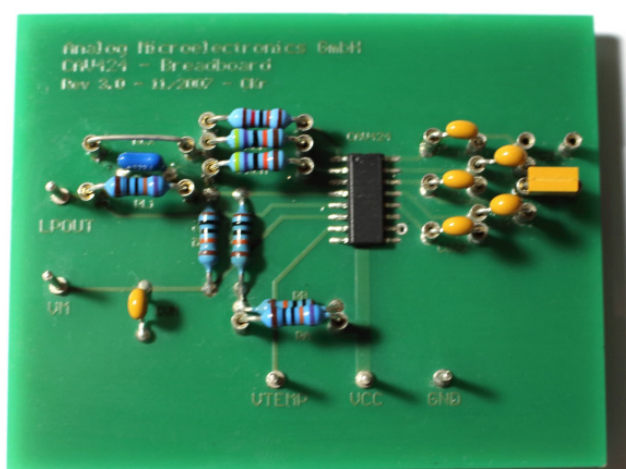


# BBCAV424

## Breadboard for the C/V-converter IC CAV424

### User Guide

### Breadboard CAV424



# BBCAV424

## Breadboard for the C/V-converter IC CAV424

### INTRODUCTION

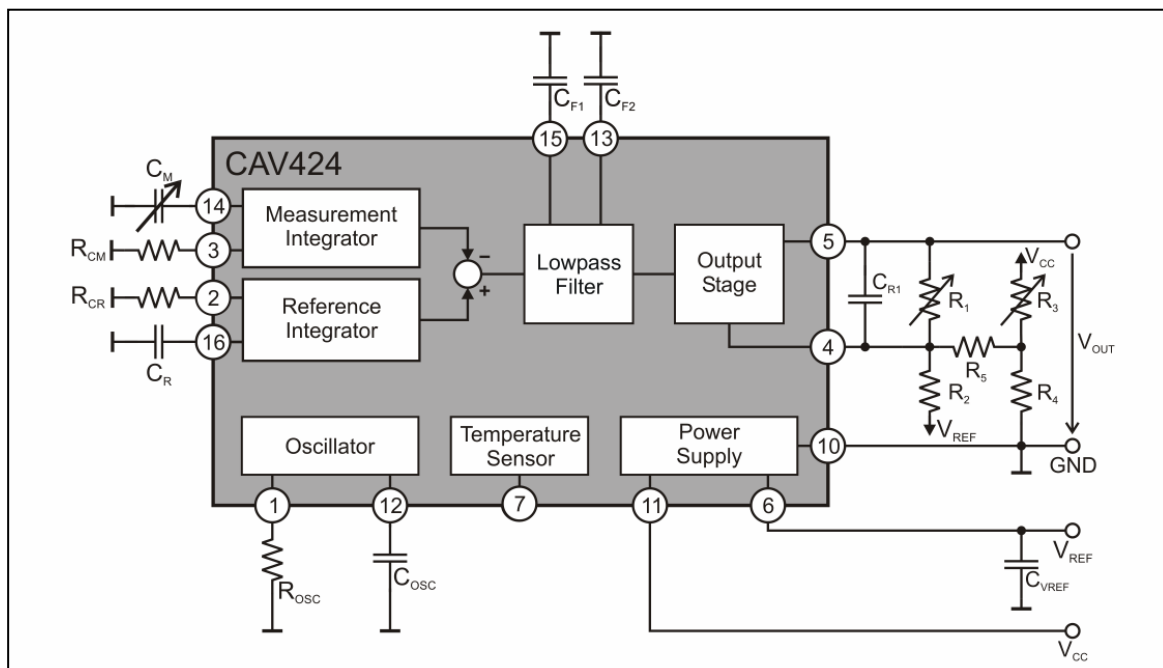
BBCAV424 enables quick and easy operation of the capacitance-to-voltage converter CAV424, which is suitable for single and differential capacitance measurements. The breadboard is pre-assembled for a capacitance range from 100 pF to 780 pF, but most of the components are mounted on sockets for easy adaptation of the capacitance range.

BBCAV424 allows the user to investigate CAV424's properties with fixed capacitor values, but it can also be used for the readout of capacitive sensing elements to study the behaviour of capacitive measurement heads (e.g. capacitive pressure sensors). If a single capacitive measurement head without integrated reference capacitance is used, the measurement head is connected to the measurement capacitance's sockets ( $CM$ ) instead of the pre-assembled ceramic capacitor. If a differential capacitive measurement head is used the variable measurement capacitance has to be connected to  $CM$ 's sockets, while the reference capacitance is connected to the reference capacitor's sockets ( $CR$ ). Both the pre-assembled capacitors on  $CM$ 's and  $CR$ 's sockets are removed.

To fit the dimensioning of the breadboard's components to the needed capacitance range the Excel-sheet `Kali_CAV424.xls` should be used.

### SCHEMATIC OF BBCAV424

BBCAV424's schematic is shown in *Figure 1*. CAV424 evaluates the measurement capacitance's value  $C_M$  against a reference capacitance  $C_R$  and generates an amplified DC output voltage  $V_{OUT}$  (for more information on the capacitance-to-voltage conversion see CAV424's datasheet). This output voltage  $V_{OUT}$  can be amplified and offset adjusted using the trimming resistors  $R_1$  and  $R_3$ , leading to a maximum output voltage range from 1V to 4V referenced to GND. If the output voltage is measured against the reference voltage at pin 6 a differential voltage output  $V_{DIFF} = V_{OUT} - V_{REF}$  with a maximum output voltage range from -1.5V to 1.5V can be obtained.



**Figure 1: Schematic of BBCAV424 revision 3.1**

# BBCAV424

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### LAYOUT

The layout of BBCAV424 is illustrated in *Figure 2*. The measurement capacitance and the reference capacitance are realized by parallel connections of CM and CM2 or CR and CR2 respectively. Therewith the user has the possibility to combine different ceramic capacitors to get values different from the E-series.

Instead of ceramic capacitors the user can also connect a single capacitive measurement head to CM or a differential measurement head to CM and CR to evaluate the properties of the specific capacitive measurement head.

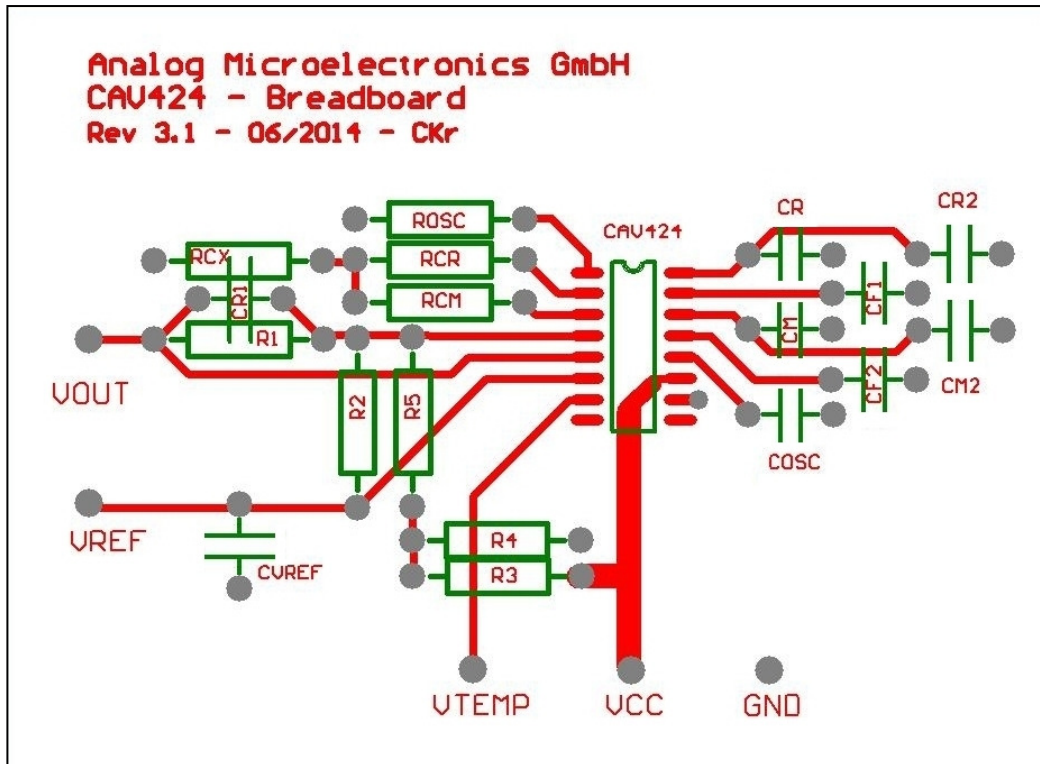


Figure 2: Layout of BBCAV 424

# BBCAV424

## Breadboard for the C/V-converter IC CAV424

### DIMENSIONING

Component	Symbol	Value	Description
Measurement Capacitor	$C_M$	100 pF	Ceramic capacitor, 5% Tol., NP0
Measurement Capacitor 2	$C_{M2}$	680 pF	Ceramic capacitor, 5% Tol., NP0
Reference Capacitor	$C_R$	100 pF	Ceramic capacitor, 5% Tol., NP0
Oscillator Capacitor	$C_{OSC}$	470 pF	Ceramic capacitor, 5% Tol., NP0
Oscillator Current Resistor	$R_{OSC}$	120 k	Metal film resistor, 1% Tol., TK 50
Measurement Integrator Current Resistor	$R_{CM}$	1000 k	Metal film resistor, 1% Tol., TK 50
Reference Integrator Current Resistor	$R_{CR}$	1000 k	Metal film resistor, 1% Tol., TK 50
Additional Integrator Current Resistor	$R_{CX}$	0 R	Wire bridge
LP-Filter Capacitor 1	$C_{F1}$	470 nF	Ceramic capacitor, 10% Tol., X7R
LP-Filter Capacitor 2	$C_{F2}$	470 nF	Ceramic capacitor, 10% Tol., X7R
Resistor	$R_2$	100 k	Metal film resistor, 1% Tol., TK 50
Resistor	$R_4$	100 k	Metal film resistor, 1% Tol., TK 50
Resistor	$R_5$	100 k	Metal film resistor, 1% Tol., TK 50
Full-Scale resistor calibration meas. value	$R_{1(start)}$	100 k	Metal film resistor, 0.1% Tol., TK 25
Offset resistor calibration meas. value	$R_{3(start)}$	100 k	Metal film resistor, 0.1% Tol., TK 25
$C_{VREF}$	$C_{VREF}$	100 nF	Ceramic capacitor, 10% Tol., X7R
$C_{R1}$	$C_{R1}$	2,2 nF	Ceramic capacitor, 10% Tol., X7R
IC1	IC1	CAV424	CAV424, SO16 package

**Table 1: Dimensioning of BBCAV424 (factory preset)**

#### Notes:

- 1) The measurement capacitor is realized by a parallel connection of  $C_M$  and  $C_{M2}$
- 2) The listed values for the trimming resistors  $R_{1(start)}$  and  $R_{3(start)}$  are the initial values at the beginning of the trimming process (see the description of the Excel-Sheet Kali\_CAV424.xls). During the calibration procedure they have to be changed or trimmed to the individually calculated values.
- 3) With BBCAV424's revision 3.1 some symbols have been adapted to the datasheet and the Excel-sheet. With the following correspondent symbols the older breadboards (revision 3.0) can still be used:  $C_{F1} = C_{L1}$ ,  $C_{F2} = C_{L2}$ ,  $R_2 = R_{L2}$ ,  $R_4 = R_B$ ,  $R_5 = R_{L3}$ ,  $R_1 = R_{L1}$ ,  $R_3 = R_A$ ,  $C_{VREF} = C_{VM}$  and  $C_{R1} = C_{RL1}$ .

### ORDERING CODE

Ordering Code	Description
BBCAV424_rev3.1	BBCAV424 – Breadboard (PCB with CAV424)

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