Specification document of MPXA4250A

Component manufacturer	NXP Semiconductors		
Model number	MPXA4250A		
Datasheets	https://www.nxp.com/docs/en/data-sheet/MPX4250A.pdf		
Specification Ver	01.00.00	Aug 31,2022	New release
	01.00.01	Sep 10,2022	Corrected license URL
	01.01.00	Sep 29,2022	Component datasheet add
	01.01.01	Oct 18,2022	Corrected license content Application item add
Documentation provided	Rui Long Lab Inc. https://rui-long-lab.com/		

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1. Component datasheet

Pressure range	20 to 250[kPa] 1.5% maximum error 0 to 85° C
Range of power supply voltage(Vdd)	4.85 to 5.35[V] 5.1[V]Typ.
Output voltage (Vout)	$Vout = Vdd \times (P \times 0.004 - 0.04) \pm Error$ Vdd =5.1[V] Temperature 0 to 85° C
Vdd vs Vout	link

Applications	IoT etc ・ Ideally suited for microprocessor or microcontroller-based systems Automotive ・ Turbo boost engine control

2. Component Software IF specification

The software interface specifications based on the MPXA4250A component specifications are as follows.
The voltage value-to-physical value conversion equation is a linear conversion equation as shown in the equation below.

ADC value to voltage value conversion formula

$$vi = (ai \times iADC\_vdd) / 2^{iADC\_bit} \quad [V]$$

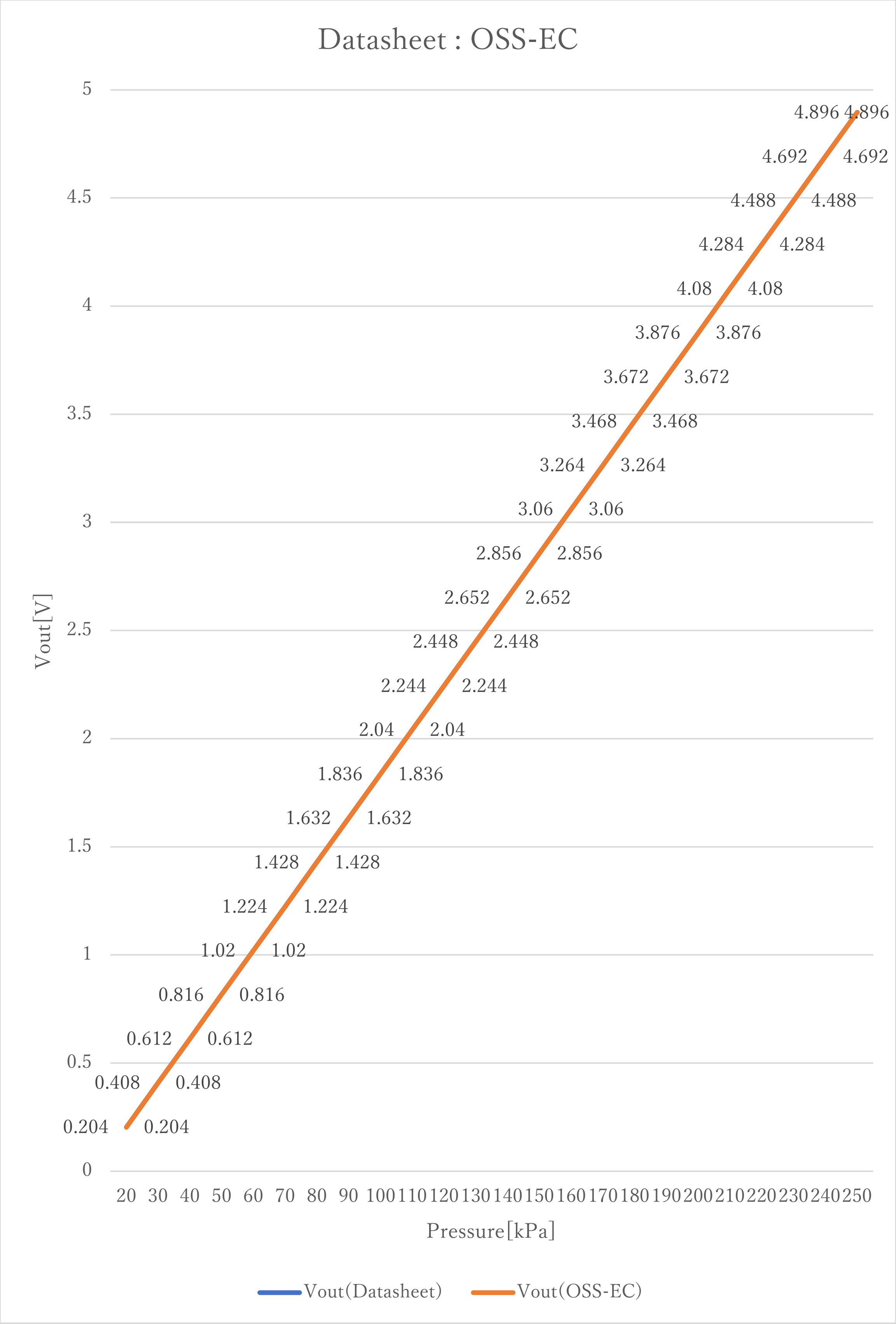
Voltage value to physical value conversion formula

$$y = (vi - iMPXA4250A\_xoff) / iMPXA4250A\_gain + iMPXA4250A\_yoff \quad [kPa]$$

$$iMPXA4250A\_min \leqq y \leqq iMPXA4250A\_max$$

ai	A/D conversion value
vi	Sensor output voltage value [V]
iADC_vdd	Sensor supply voltage value [V]
iADC_bit	A/D conversion bit length
y	Pressure value [kPa]

```
#define iMPXA4250A_xoff         ( -0.04F*iADC_vdd )     // X offset [V]
#define iMPXA4250A_yoff         0.0F                    // Y offset [kPa]
#define iMPXA4250A_gain         ( 0.004F*iADC_vdd )     // Gain [V/kPa]
#define iMPXA4250A_max          250.0F                  // Pressure Max [kPa]
#define iMPXA4250A_min          20.0F                   // Pressure Min [kPa]
```


Datasheet : OSS-EC
Vout[V]
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0.204
0.408
0.612
0.816
1.02
1.224
1.428
1.632
1.836
2.04
2.244
2.448
2.652
2.856
3.06
3.264
3.468
3.672
3.876
4.08
4.284
4.488
4.692
4.896
20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250
Pressure[kPa]
Vout(Datasheet)
Vout(OSS-EC)

3. File Structure and Definitions

MPXA4250A.h

```
#include "user_define.h"

// Components number
#define iMPXA4250A              100U                    // NXP MPXA4250A

// MPXA4250A System Parts definitions
#define iMPXA4250A_xoff         ( -0.04F*iADC_vdd )     // X offset [V]
#define iMPXA4250A_yoff         0.0F                    // Y offset [kPa]
#define iMPXA4250A_gain         ( 0.004F*iADC_vdd )     // Gain [V/kPa]
#define iMPXA4250A_max          250.0F                  // Pressure Max [kPa]
#define iMPXA4250A_min          20.0F                   // Pressure Min [kPa]

extern const tbl_adc_t tbl_MPXA4250A;
```

MPXA4250A.cpp

```
#include        "MPXA4250A.h"
#if     iMPXA4250A_ma == iSMA                       // Simple moving average filter
static float32 MPXA4250A_sma_buf[iMPXA4250A_SMA_num];
static const sma_f32_t MPXA4250A_Phy_SMA =
{
        iInitial ,                                  // Initial state
        iMPXA4250A_SMA_num ,                       // Simple moving average number & buf size
        0U ,                                        // buffer position
        0.0F ,                                      // sum
        &MPXA4250A_sma_buf[0]                       // buffer
};
#elif   iMPXA4250A_ma == iEMA                       // Exponential moving average filter
static const ema_f32_t MPXA4250A_Phy_EMA =
{
        iInitial ,                                  // Initial state
        0.0F ,                                      // Xn-1
        iMPXA4250A_EMA_K                            // Exponential smoothing factor
};
#elif   iMPXA4250A_ma == iWMA                       // Weighted moving average filter
static float32 MPXA4250A_wma_buf[iMPXA4250A_WMA_num];
static const wma_f32_t MPXA4250A_Phy_WMA =
{
        iInitial ,                                  // Initial state
        iMPXA4250A_WMA_num ,                         // Weighted moving average number & buf
size
        0U ,                                        // buffer poition
        iMPXA4250A_WMA_num * (iMPXA4250A_WMA_num + 1)/2 , // kn sum
        &MPXA4250A_wma_buf[0]                       // Xn buffer
};
#else                                               // Non-moving average filter
#endif

#define iDummy_adr      0xffffffff                  // Dummy address
```

```
const tbl_adc_t tbl_MPXA4250A =
{
        iMPXA4250A              ,
        iMPXA4250A_pin          ,
        iMPXA4250A_xoff         ,
        iMPXA4250A_yoff         ,
        iMPXA4250A_gain         ,
        iMPXA4250A_max          ,
        iMPXA4250A_min          ,
        iMPXA4250A_ma           ,

#if     iMPXA4250A_ma == iSMA                           // Simple moving average filter
        &MPXA4250A_Phy_SMA      ,
        (ema_f32_t*)iDummy_adr  ,
        (wma_f32_t*)iDummy_adr
#elif   iMPXA4250A_ma == iEMA                           // Exponential moving average filter
        (sma_f32_t*)iDummy_adr  ,
        &MPXA4250A_Phy_EMA      ,
        (wma_f32_t*)iDummy_adr
#elif   iMPXA4250A_ma == iWMA                           // Weighted moving average filter
        (sma_f32_t*)iDummy_adr  ,
        (ema_f32_t*)iDummy_adr  ,
        &MPXA4250A_Phy_WMA
#else                                                   // Non-moving average filter
        (sma_f32_t*)iDummy_adr  ,
        (ema_f32_t*)iDummy_adr  ,
        (wma_f32_t*)iDummy_adr
#endif

};
```