Specification document of S-5813A, S-5814A

Component manufacturer	ABLIC		
Model number	S-5813A, S-5814A		
Datasheets	S-5813A/5814A Series TEMPERATURE SENSOR IC (ablic.com)		
Specification Ver	01.00.00	Sep 30,2022	New release
Documentation provided	Rui Long Lab Inc. https://rui-long-lab.com/		

1. Component datasheet

Accuracy against temperature	S-5813A ±5.0° C (-30 ° C to +100° C) S-5814A ±2.5° C (-30 ° C to +100° C)
Range of power supply voltage(Vdd)	2.9 to 10.0[V]
Output voltage (Vout)	Linear -11.04 [mV/° C] Typ. (-30° C to 100° C) Vdd = 5.0 [V] -30 [° C] 2.582 [V] Typ. 30 [° C] 1.940 [V] Typ. 100 [° C] 1.145 [V] Typ.
Vdd vs Vout	Non-link (ΔVout 0.006 to 0.007 [V])

Ta[° C]	Vdd[V]	Vout[V]
-40	3.00	2.677
	10.00	2.683
30	2.48	1.934
	10.00	1.940
100	2.48	1.142
	10.00	1.149

2. Component Software IF specification

The software interface specifications based on the S-5813A/S-5814A 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

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

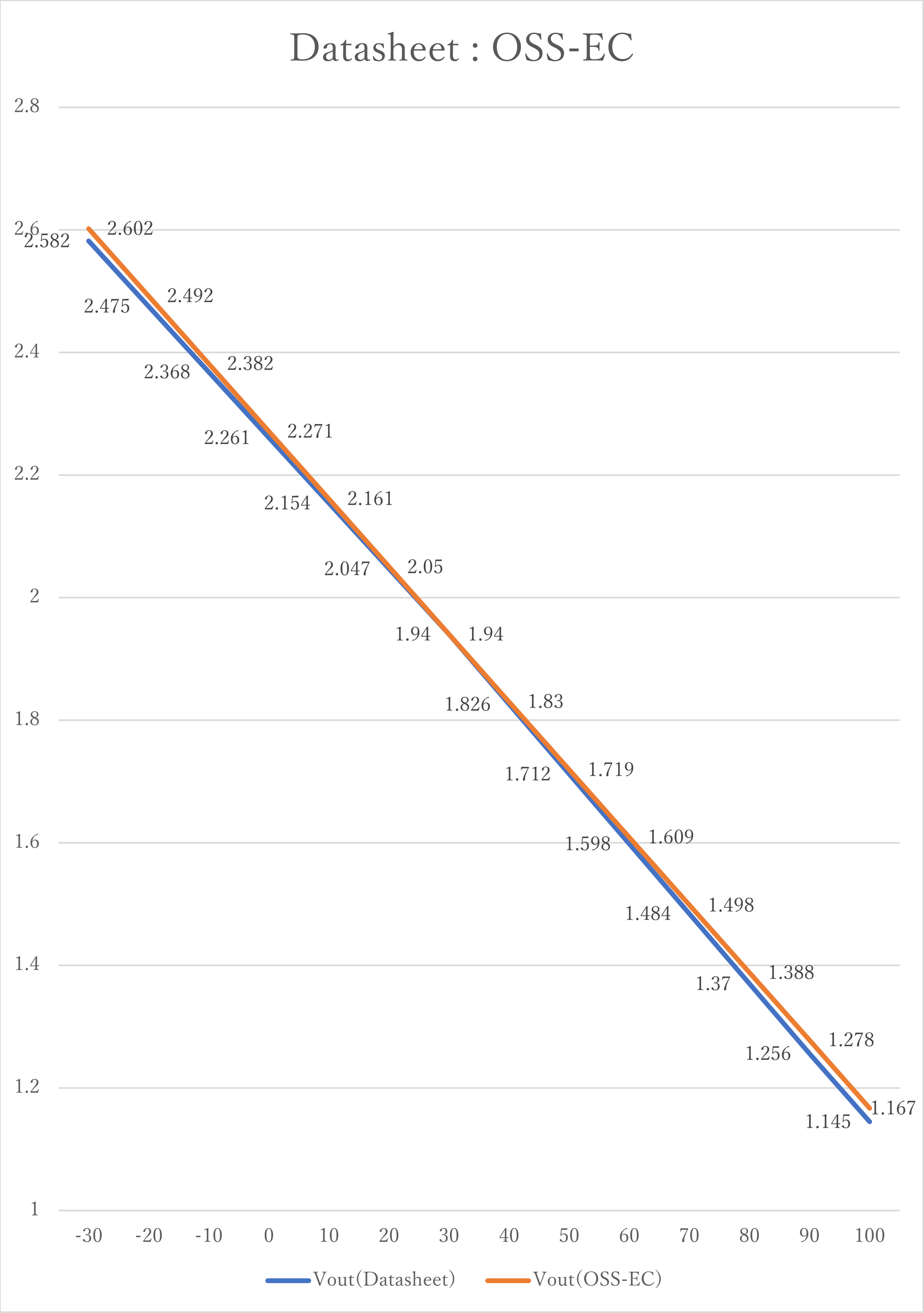
Voltage value to physical value conversion formula

$$y = (vi - iS5813A\_xoff) / iS5813A\_gain + iS5813A\_yoff \quad [℃]$$

$$iS5813A\_min \leqq y \leqq iS5813A\_max$$

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	Temperature value [℃]

```
#define iS5813A_xoff        1.940F          // X offset [V]
#define iS5813A_yoff        30.0F           // Y offset [℃]
#define iS5813A_gain        -0.01104F       // Gain [V/℃]
#define iS5813A_max         100.0F          // Temperature Max [℃]
#define iS5813A_min         -30.0F          // Temperature Min [℃]
```


Datasheet : OSS-EC
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
2.582
2.475
2.368
2.261
2.154
2.047
1.94
1.826
1.712
1.598
1.484
1.37
1.256
1.145
2.602
2.492
2.382
2.271
2.161
2.05
1.94
1.83
1.719
1.609
1.498
1.388
1.278
1.167
Vout(Datasheet)
Vout(OSS-EC)

3. File Structure and Definitions

S5813A.h

```
#include "user_define.h"

// Components number
#define iS5813A             104U                       // ABLIC S-5813A, S-5814A

// S-5813A,S-5814A System Parts definitions
#define iS5813A_xoff        1.940F                     // X offset [V]
#define iS5813A_yoff        30.0F                      // Y offset [℃]
#define iS5813A_gain        -0.01104F                  // Gain [V/℃]
#define iS5813A_max         100.0F                     // Temperature Max [℃]
#define iS5813A_min         -30.0F                     // Temperature Min [℃]

extern const tbl_adc_t tbl_S5813A;
```

S5813A.cpp

```
#include        "S5813A.h"
#if     iS5813A_ma == iSMA                        // Simple moving average filter
static float32 S5813A_sma_buf[iS5813A_SMA_num];
static const sma_f32_t S5813A_Phy_SMA =
{
        iInitial ,                                  // Initial state
        iS5813A_SMA_num ,                          // Simple moving average number & buf size
        0U ,                                        // buffer position
        0.0F ,                                      // sum
        &S5813A_sma_buf[0]                          // buffer
};
#elif   iS5813A_ma == iEMA                          // Exponential moving average filter
static const ema_f32_t S5813A_Phy_EMA =
{
        iInitial ,                                  // Initial state
        0.0F ,                                      // Xn-1
        iS5813A_EMA_K                               // Exponential smoothing factor
};
#elif   iS5813A_ma == iWMA                          // Weighted moving average filter
static float32 S5813A_wma_buf[iS5813A_WMA_num];
static const wma_f32_t S5813A_Phy_WMA =
{
        iInitial ,                                  // Initial state
        iS5813A_WMA_num ,                      // Weighted moving average number & buf size
        0U ,                                        // buffer poition
        iS5813A_WMA_num * (iS5813A_WMA_num + 1)/2 , // kn sum
        &S5813A_wma_buf[0]                          // Xn buffer
};
#else                                               // Non-moving average filter
#endif

#define iDummy_adr      0xffffffff                  // Dummy address

const tbl_adc_t tbl_S5813A =
{
        iS5813A               ,
        iS5813A_pin           ,
        iS5813A_xoff          ,
        iS5813A_yoff          ,
        iS5813A_gain          ,
        iS5813A_max           ,
        iS5813A_min           ,
        iS5813A_ma            ,

#if     iS5813A_ma == iSMA                       // Simple moving average filter
        &S5813A_Phy_SMA       ,
        (ema_f32_t*)iDummy_adr  ,
        (wma_f32_t*)iDummy_adr
#elif   iS5813A_ma == iEMA                       // Exponential moving average filter
        (sma_f32_t*)iDummy_adr  ,
        &S5813A_Phy_EMA       ,
        (wma_f32_t*)iDummy_adr
#elif   iS5813A_ma == iWMA                       // Weighted moving average filter
        (sma_f32_t*)iDummy_adr  ,
        (ema_f32_t*)iDummy_adr  ,
        &S5813A_Phy_WMA
#else                                              // Non-moving average filter
        (sma_f32_t*)iDummy_adr  ,
        (ema_f32_t*)iDummy_adr  ,
        (wma_f32_t*)iDummy_adr
#endif

};
```