Specification document of S-58LM20A

Component manufacturer	ABLIC
Model number	S-58LM20A
Datasheets	S-58LM20A Series TEMPERATURE SENSOR IC (ablic.com)
Specification Ver	01.00.00 Sep 12,2022 New release
	01.01.00 Sep 29,2022 Component datasheet add
	Data correction
Documentation provided	Rui Long Lab Inc. https://rui-long-lab.com/

1. Component Datasheet

Accuracy against temperature	±2.5° C (-55 ° C to +130° C)
Range of power supply voltage(Vdd)	2.4 to 5.5[V]
Output voltage (Vout)	Linear -11.77 [mV/° C] Typ. (-30° C to 130° C)
	-30[° C] 2.205 [V] Typ.
	30[° C] 1.515 [V] Typ.
	130[° C] 0.303 [V] Typ.
Vdd vs Vout	Non-link

2. Component Software IF specification

The software interface specifications based on the S-58LM20A 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

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

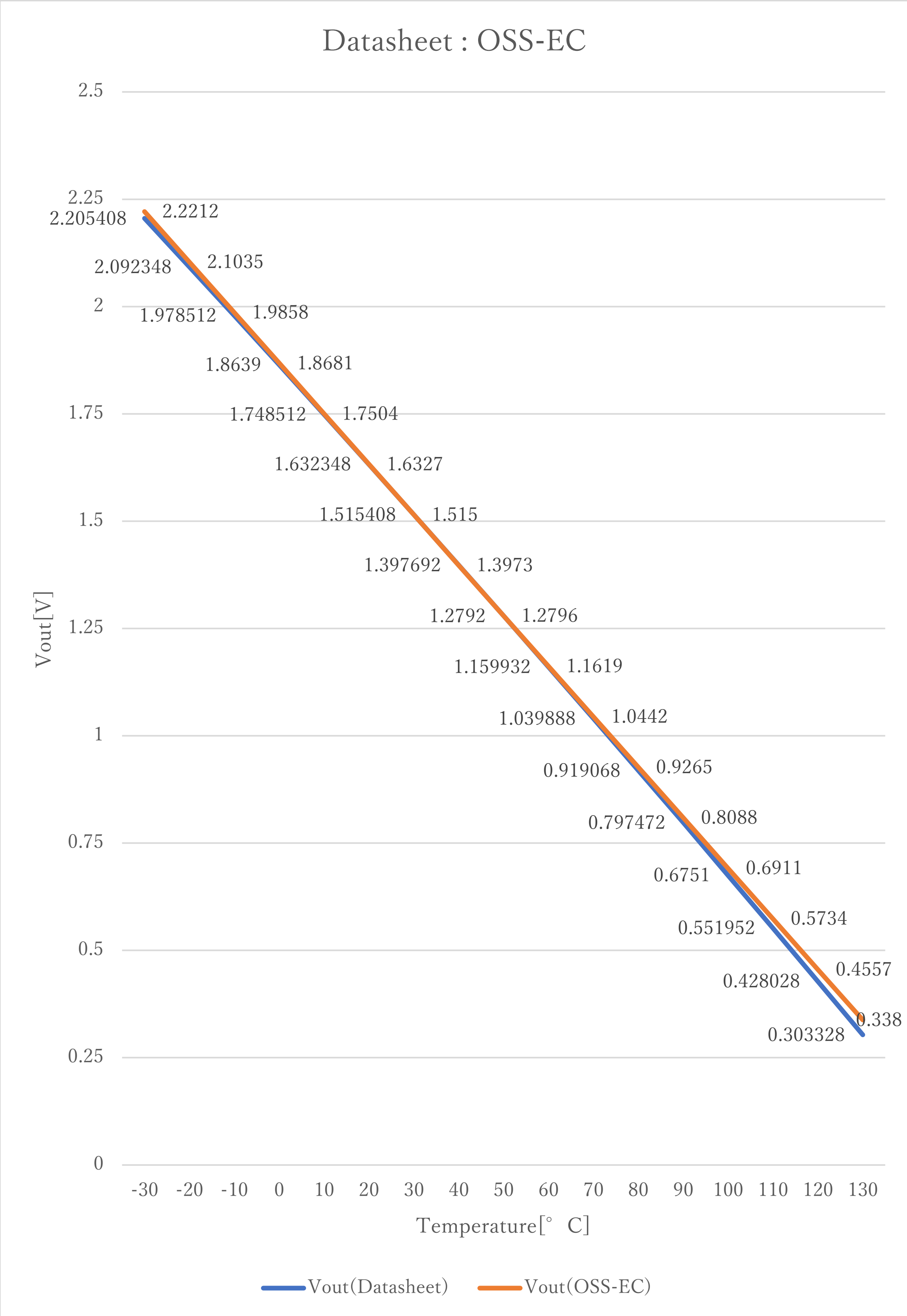
Voltage value to physical value conversion formula

$$y = (vi - iS58LM20A\_xoff) / iS58LM20A\_gain + iS58LM20A\_yoff \quad [°C]$$

$$iS58LM20A\_min \leqq y \leqq iS58LM20A\_max$$

```
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 [° C]
#define iS58LM20A_xoff      1.515F          // X offset [V]
#define iS58LM20A_yoff      30.0F           // Y offset [° C]
#define iS58LM20A_gain      -0.01177F       // Gain [V/° C]
#define iS58LM20A_max       130.0F          // Temperature Max [° C]
#define iS58LM20A_min       -30.0F          // Temperature Min [° C]

Note : Non-Linear iS58LM20A_min  -55.0F
```



$$\text{Vout(Datasheet)} = (-3.88 \times 10^{-6} \times T^{2}) + (-1.15 \times 10^{-2} \times T) + 1.8639\ \text{V}$$

3. File Structure and Definitions

S58LM20A.h

```
#include "user_define.h"

// Components number
#define iS58LM20A            103U                    // ABLIC S-58LM20A

// S-58LM20A System Parts definitions
#define iS58LM20A_xoff       1.515F                  // X offset [V]
#define iS58LM20A_yoff       30.0F                   // Y offset [° C]
#define iS58LM20A_gain       -0.01177F               // Gain [V/° C]
#define iS58LM20A_max        130.0F                  // Temperature Max [° C]
#define iS58LM20A_min        -30.0F                  // Temperature Min [° C]

extern const tbl_adc_t tbl_S58LM20A;
```

S58LM20A.cpp

```
#include        "S58LM20A.h"
#if     iS58LM20A_ma == iSMA                        // Simple moving average filter
static float32 S58LM20A_sma_buf[iS58LM20A_SMA_num];
static const sma_f32_t S58LM20A_Phy_SMA =
{
        iInitial ,                                  // Initial state
        iS58LM20A_SMA_num ,                        // Simple moving average number & buf size
        0U ,                                        // buffer position
        0.0F ,                                      // sum
        &S58LM20A_sma_buf[0]                        // buffer
};
#elif   iS58LM20A_ma == iEMA                        // Exponential moving average filter
static const ema_f32_t S58LM20A_Phy_EMA =
{
        iInitial ,                                  // Initial state
        0.0F ,                                      // Xn-1
        iS58LM20A_EMA_K                             // Exponential smoothing factor
};
#elif   iS58LM20A_ma == iWMA                        // Weighted moving average filter
static float32 S58LM20A_wma_buf[iS58LM20A_WMA_num];
static const wma_f32_t S58LM20A_Phy_WMA =
{
        iInitial ,                                  // Initial state
        iS58LM20A_WMA_num ,                      // Weighted moving average number & buf size
        0U ,                                        // buffer poition
        iS58LM20A_WMA_num * (iS58LM20A_WMA_num + 1)/2 , // kn sum
        &S58LM20A_wma_buf[0]                        // Xn buffer
};
#else                                               // Non-moving average filter
#endif

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

```
const tbl_adc_t tbl_S58LM20A =
{
        iS58LM20A                   ,
        iS58LM20A_pin               ,
        iS58LM20A_xoff              ,
        iS58LM20A_yoff              ,
        iS58LM20A_gain              ,
        iS58LM20A_max               ,
        iS58LM20A_min               ,
        iS58LM20A_ma                ,

#if     iS58LM20A_ma == iSMA                        // Simple moving average filter
        &S58LM20A_Phy_SMA           ,
        (ema_f32_t*)iDummy_adr      ,
        (wma_f32_t*)iDummy_adr
#elif   iS58LM20A_ma == iEMA                        // Exponential moving average filter
        (sma_f32_t*)iDummy_adr      ,
        &S58LM20A_Phy_EMA           ,
        (wma_f32_t*)iDummy_adr
#elif   iS58LM20A_ma == iWMA                        // Weighted moving average filter
        (sma_f32_t*)iDummy_adr      ,
        (ema_f32_t*)iDummy_adr      ,
        &S58LM20A_Phy_WMA
#else                                               // Non-moving average filter
        (sma_f32_t*)iDummy_adr      ,
        (ema_f32_t*)iDummy_adr      ,
        (wma_f32_t*)iDummy_adr
#endif

};
```