

# Application Note TSYS01

## PRODUCT HIGHLIGHTS



- High Accuracy up to  $\pm 0.1^\circ\text{C}$
- Very Small Size
- Ready for SMT Assembly
- Multiple Interfaces I2C, SPI
- Adjustment of High Accuracy Temperature Range on Request
- Low Current Consumption
- Low Self Heating
- Additional Input for External Temperature Sensor Component

## DESCRIPTION

The TSYS01 is a single chip, versatile, new technology temperature sensor. The TSYS01 provides factory calibrated temperature information. It includes a temperature sensing chip and a 24 bit  $\Delta\Sigma$ -ADC. The essence of the digital 24 bit temperature value and the internal factory set calibration values lead to highly accurate temperature information accompanied by high measurement resolution.

The TSYS01 can be interfaced to any microcontroller by an I<sup>2</sup>C or SPI interface. This microcontroller has to calculate the temperature result based on the ADC values and the calibration parameters.

The basic working principle is:

- Converting temperature into digital 16/24 bit ADC value
- Providing calibration coefficients
- Providing ADC value and calibration coefficients by SPI or I<sup>2</sup>C interface.



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# Application Note TSYS01

## SPECIFICATION OVERVIEW

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Supply Voltage	V <sub>DD</sub>	stabilized	2.2		3.6	V
High Accuracy Supply Voltage	V <sub>DD</sub>	To achieve Acc1	3.2		3.4	V
Supply Current	I <sub>DD</sub>	1 sample per second			12.5	μA
Standby current	I <sub>S</sub>	No conversion, V <sub>DD</sub> = 3V T = 25°C T = 85°C		0.02 0.70	0.14 1.40	μA μA
Peak Supply Current	I <sub>DD</sub>	During conversion		1.4		mA
Conversion time	T <sub>CONV</sub>		7.40	8.22	9.04	ms
Serial Data Clock SPI	F <sub>SCLK</sub>				20	MHz
Serial Data Clock I <sup>2</sup> C	F <sub>SCL</sub>				400	kHz
VDD Capacitor		Place close to the chip	100nF			
Temperature Measurement Range	T <sub>RANG</sub>		-40		125	°C
Accuracy 1	T <sub>ACC1</sub>	-5°C < T < +50°C V <sub>DD</sub> = 3.2V – 3.4V	-0.1		+0.1	°C
Accuracy 2	T <sub>ACC2</sub>	-40°C < T < +125°C V <sub>DD</sub> = 3.2V – 3.4V	-0.5		+0.5	°C
PSSR		V <sub>DD</sub> = 2.7 – 3.6 T = 25°C, C = 100nF			0.2	°C
Temperature Resolution	T <sub>RES</sub>				0.01	°C
Time Constant	T	t10-90 T <sub>1</sub> =25°C T <sub>2</sub> =75°C PCB 900mm <sup>2</sup> x 1.5mm FR4		9		s
Self Heating	SH <sub>1</sub>	10 samples/s, 60s, still air			0.02	°C

## DIGITAL INPUTS (SCLK, SDI, CSB, PS)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input High Voltage	V <sub>IH</sub>	V <sub>DD</sub> = 2.2...3.6V	0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
Input Low Voltage	V <sub>IL</sub>	V <sub>DD</sub> = 2.2...3.6V	0.0 V <sub>DD</sub>		0.3 V <sub>DD</sub>	V
CS low to first SCLK rising	t <sub>CSL</sub>		21			ns
CS high to first SCLK rising	t <sub>CSH</sub>		21			ns
SDI setup to first SCLK rising	T <sub>DSO</sub>		6			ns
SDI hold to first SCLK rising	T <sub>DO</sub>		6			ns

## DIGITAL OUTPUTS (SDA, SDO)

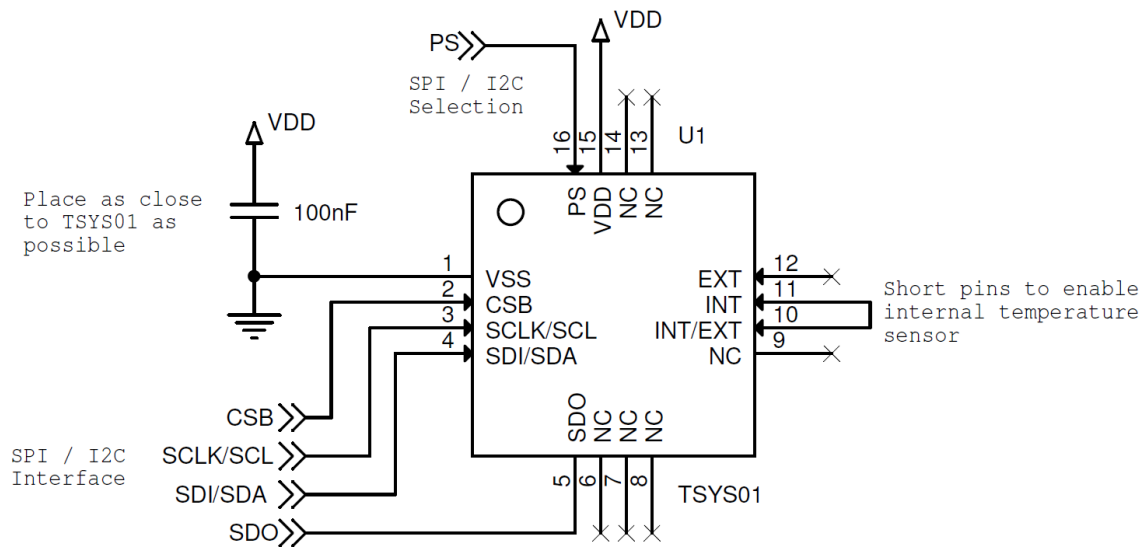
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output High Voltage	V <sub>OH</sub>	I <sub>Source</sub> = 1mA	0.8 V <sub>DD</sub>		V <sub>DD</sub>	V
Output Low Voltage	V <sub>OL</sub>	I <sub>Sink</sub> = 1mA	0.0 V <sub>DD</sub>		0.2 V <sub>DD</sub>	V
SDO setup to first SCLK rising	t <sub>QS</sub>		10			ns
SDO hold to first SCLK rising	t <sub>QH</sub>		0			ns

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## CONNECTION DIAGRAMS

### USING INTEGRATED SENSOR COMPONENT

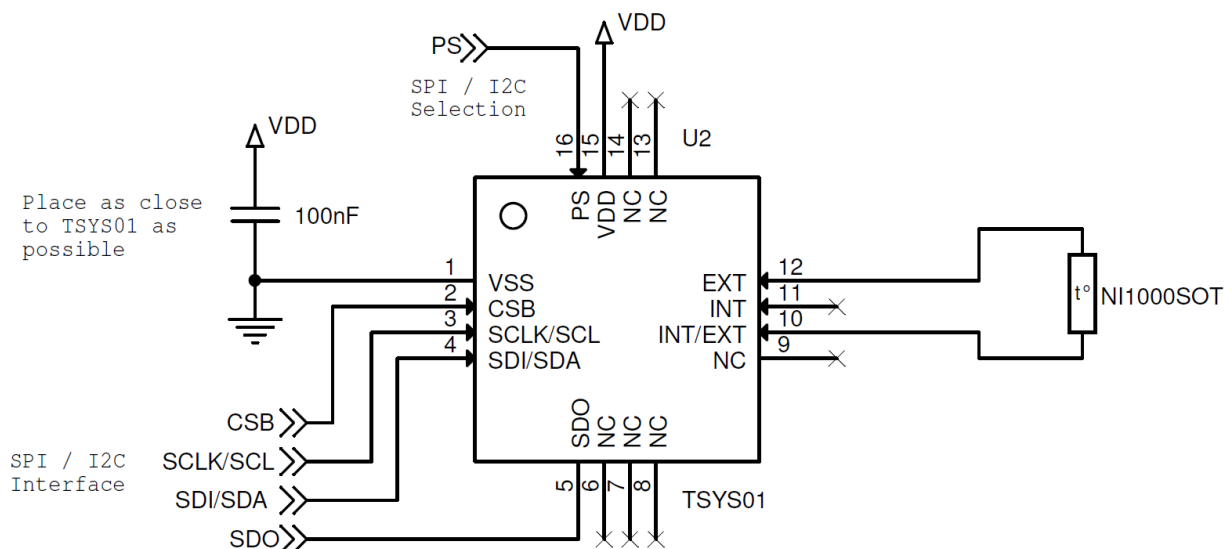
The TSYS01 is factory calibrated for usage of the internal temperature sensor component. Short pin 10 and pin 11 in order to enable the internal sensor component.



### USING EXTERNAL SENSOR COMPONENT

The TSYS01 can be used for remote temperature measurement. A RTD like the NI1000SOT ([LINK](#)) has to be wired to the pins 10 and 12 while pin 11 is unconnected.

The factory-set calibration parameters are not valid for external sensor application.



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## PIN FUNCTION TABLE

Pin	Name	Type	Function
1	VSS	G	Ground
2	CSB	DI	SPI: Chip Select (active low) I <sup>2</sup> C: Address Selection
3	SCLK/SCL	DI	SPI: Serial Data Clock I <sup>2</sup> C: Serial Data Clock
4	SDI/SDA	DIO	SPI: Serial Data Input I <sup>2</sup> C: Data Input / Output
5	SDO	DO	SPI: Serial Data Output
6 – 9	NC	---	Not connected / Do not connect
10	INT / EXT	DI/AI	Internal / External Sensor Selection Internal Sensor: Connect Pin10 with Pin11 External Sensor: Connect external Sensor
11	INT	DI/AI	Internal / External Sensor Selection Internal Sensor: Connect Pin11 with Pin10 External Sensor: Leave Unconnected
12	EXT	DI/AI	Internal / External Sensor Selection Internal Sensor: Leave Unconnected External Sensor: Connect external Sensor
13 – 14	NC	---	Not connected / Do not connect
15	VDD	P	Supply Voltage
16	PS	DI	Communication protocol select (0=SPI, 1=I <sup>2</sup> C)

## SOLDER RECOMMENDATION

Solder reflow process according to IPC/JEDEC J-STD-020D (Pb-Free Process) is recommended.

# Application Note TSYS01

## MEASUREMENT GUIDELINES

### GENERAL

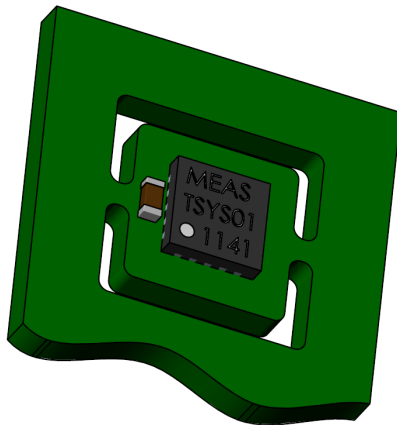
In order to achieve the most accurate temperature measurement results, please notice these advices

- Use a stabilized and noise free supply voltage
- Place a ceramic capacitor close to the supply pins
- Keep supply lines as short as possible
- Separate TSYS01 from any heat source which is not meant to be measured.
- Avoid air streams if the PCB temperature is meant to be measured.

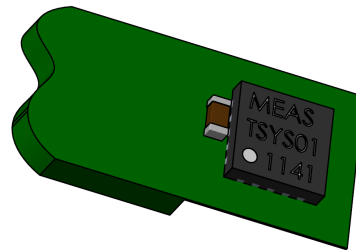
### MEASUREMENT OF AIR TEMPERATURE

- Separate TSYS01 from the remaining electronics by PCB layout.

Milled thermal relief

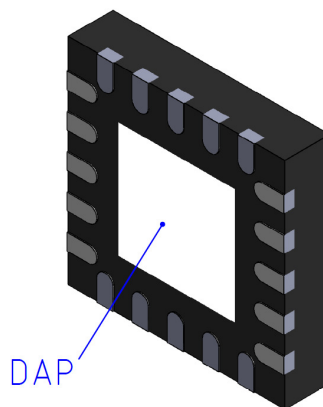


Flex PCB



### MEASUREMENT PCB TEMPERATURE

- Connect DAP (die attach pad) to copper layer of the PCB.



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## INTERFACE DESCRIPTION

### PROTOCOL SELECTION

PS pin input level has to be defined in dependence to protocol selection.

- PS = 0 activates SPI.
- PS = 1 activates I<sup>2</sup>C.

### I<sup>2</sup>C INTERFACE

A I<sup>2</sup>C communication message starts with a start condition and it is ended by a stop condition. Each command consists of two bytes: the address byte and command byte.

### I<sup>2</sup>C ADDRESS SELECTION

The I<sup>2</sup>C address can be selected by CSB pin.

- CSB=1 then the address is 1110110x.
- CSB=0 the address is 1110111x.

Therefore, two TSYS01 can be interfaced on the same I<sup>2</sup>C bus.

### SPI INTERFACE

The serial interface is a 4-wire SPI bus, operating as a slave. CS (chip select), SCLK (serial clock), SDI (serial data in), and SDO (serial data out) are used to interact with the SPI master.

Communication with the chip starts when CS is pulled to low and ends when CS is pulled to high.

SCLK is controlled by the SPI master and idles low (SCLK low on CS transitions, mode 0).

A mode where the clock alternatively idles high is also supported (mode 3).

### COMMANDS

The commands are the same for SPI and I<sup>2</sup>C interface.

There are four commands:

- Reset
- Read PROM (calibration parameters)
- Start ADC Temperature conversion
- Read ADC Temperature result

Command	Hex Value
Reset	0x1E
Start ADC Temperature Conversion	0x48
Read ADC Temperature Result	0x00
PROM Read Address 0	0xA0
PROM Read Address 1	0xA2
PROM Read Address 2	0xA4
PROM Read Address 3	0xA6
PROM Read Address 4	0xA8
PROM Read Address 5	0xAA
PROM Read Address 6	0xAC
PROM Read Address 7	0xAE

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## INTERFACE CODE EXAMPLES

### SPI INTERFACE

The code examples shown are meant to be understood as exemplary. The code has to be adjusted with respect to the used microcontroller in order to work correctly.

```

/*****
*      Function:      TSYS01_SPI_INIT                                *
*      Input:         ---                                           *
*      Return:        ---                                           *
*      Description:   Initialization of SPI Port                    *
*****/
void TSYS01_SPI_INIT(void)
{
    // Configure IOs
    SDI_DIR = IN;                // SDI = Input
    SDO_DIR = OUT;               // SDO = Output
    SCL_DIR = OUT;               // SCL = Output
    CSB_DIR = OUT;               // CSB = Output
}

/*****
*      Function:      TSYS01_SPI_TRANSFER                            *
*      Input:         char cTransmit    Byte to be send to TSYS01  *
*      Return:        char cReceive     Byte received from TSYS01  *
*      Description:   Sends one byte to TSYS01 and read on byte    *
*                    from TSYS01 simultaneously                    *
*****/
char TSYS01_SPI_TRANSFER(char cTransmit)
{
    char cReceive = 0;
    char cBit = 0;

    SDO = 0;    SCL = 0;                // Reset SPI Lines

    for (cBit = 0; cBit < 8; cBit++)
    {
        cReceive = cReceive << 1;        // Shift Receive Register
        SCL = 0;                          // SCL = 0
        SDO = (cTransmit >> (7 - cBit));  // Outupt next Bit on SDO
        SCL = 1;                          // SCL = 1
        cReceive = cReceive | SDI;        // Input next Bit on SDI
    }

    RC3 = 0;    RC5 = 0;                // Reset SPI Lines

    return cReceive;
}

```

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```

/*****
*      Function:      TSYS01_SPI_READ_ADC                      *
*      Input:         ---                                      *
*      Return:        cADC[4] via call by reference            *
*      Description:   Reads four bytes of ADC result (24bit)   *
*****/
void TSYS01_SPI_READ_ADC(char *cADC)
{
    char cByte;

    CSB = 1;
    CSB = 0;                                // Enable Chip Select

    cADC(0) = TSYS01_TRANSFER(0x48);         // Start Conversion
    while (SDI == 0);                        // Wait for Conversion done

    CSB = 1;
    CSB = 0;                                // Enable Chip Select
    for (cByte = 0; cByte < 4; cByte++)
    {
        cADC[cByte] = TSYS01_TRANSFER(0x00); // READ ADC
    }
    CSB = 1;
}

/*****
*      Function:      TSYS01_SPI_READ_PROM_WORD                *
*      Input:         char cAddress Address of Prom to be read *
*      Return:        cPPROM[2] via call by reference           *
*      Description:   Reads two byte (on word) of Prom memory  *
*****/
void TSYS01_SPI_READ_PROM_WORD(char cAddress, char *cPROM)
{
    cAdress = 0xA0 | (cAddress << 1);

    CSB = 1;
    CSB = 0;                                // Enable Chip Select
    cPPROM[0] = TSYS01_TRANSFER (cAdress);   // Command Read PROM

    cPPROM[0] = TSYS01_TRANSFER(0x00);       // Read high byte
    cPPROM[1] = TSYS01_TRANSFER(0x00);       // Read low byte
    CSB = 1;
}

```



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## I<sup>2</sup>C INTERFACE

The code examples shown are meant to be understood as exemplary. The code has to be adjusted with respect to the used microcontroller in order to work.

```

/*****
*      Function:      TSYS01_I2C_INIT                                *
*      Input:         ---                                           *
*      Return:        ---                                           *
*      Description:   Initialization of I2C Port                    *
*****/
void TSYS01_I2C_INIT(void)
{
    I2C_SCK_DIR = OUT;                // SCK = Output
    I2C_SDA_DIR = OUT;                // SDA = Output
}

/*****
*      Function:      TSYS01_I2C_READ_PROM_WORD                    *
*      Input:         char cAddress Address of Prom to be read      *
**      Return:       cPPROM[2] via call by reference               *
*      Description:   Reads two byte (on word) of Prom memory      *
*****/
void TSYS01_I2C_READ_PROM_WORD(char cAddress, char *cPPROM)
{
    cAddress = 0xA0 | (cAddress << 1);

    TSYS01_I2C_START();                // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADDRESS | I2C_W); // Send I2C-Address, Write
                                                    // Mode
    TSYS01_I2C_GET_ACK();                // Get ACK
    TSYS01_I2C_SEND_BYTE(cAddress);      // Send Read PROM command
                                                    // including address to read
    TSYS01_I2C_GET_ACK();                // Get ACK
    TSYS01_I2C_STOP();                  // Send Stop Condition

    TSYS01_I2C_START();                // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADDRESS | I2C_R); // Send I2C-Address, Read Mode
    TSYS01_I2C_GET_ACK();                // Get ACK
    cPPROM[0] = TSYS01_I2C_RECEIVE_BYTE(void) // Read high byte
    I2C_SET_ACK(TRUE);                    // Set ACK
    cPPROM[1] = TSYS01_I2C_RECEIVE_BYTE(void) // Read low byte
    I2C_SET_ACK(FALSE);                   // Set NACK
    TSYS01_I2C_STOP();                  // Send Stop Condition
}

```

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```

/*****
*      Function:      TSYS01_I2C_READ_ADC      *
*      Input:         ---                      *
*      Return:        cADC[4] via call by reference      *
*      Description:   Reads four bytes of ADC result (24bit)      *
*****/
void TSYS01_I2C_READ_ADC(char *cADC)
{
    char cByte;

    // Send command to start ADC conversion
    TSYS01_I2C_START(); // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADRESS | I2C_W); // Send I2C-Address, Write
                                                    // Mode
    TSYS01_I2C_GET_ACK(); // Get ACK
    TSYS01_I2C_SEND_BYTE(0x48); // Start Conversion
    TSYS01_I2C_GET_ACK(); // Get ACK
    TSYS01_I2C_STOP(); // Send Stop Condition

    // Repeat this block until Acknowledge is true
    // or wait 10ms for conversion to be done
    TSYS01_I2C_START(); // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADRESS | I2C_W); // Send I2C-Address, Write Mode
    TSYS01_I2C_GET_ACK(); // Get ACK
    TSYS01_I2C_STOP(); // Send Stop Condition

    TSYS01_I2C_START(); // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADRESS | I2C_W); // Send I2C-Address, Write Mode
    TSYS01_I2C_GET_ACK(); // Get ACK
    TSYS01_I2C_SEND_BYTE(0x00); // Send Read ADC command
    TSYS01_I2C_GET_ACK(); // Get ACK
    TSYS01_I2C_STOP(); // Send Stop Condition

    TSYS01_I2C_START(); // Send Start Condition
    TSYS01_I2C_TRANSMIT_BYTE(I2C_ADRESS | I2C_R); // Send I2C-Address, Read Mode
    TSYS01_I2C_GET_ACK(); // Get ACK
    cADC[0] = TSYS01_I2C_RECEIVE_BYTE(void) // Read first byte
    I2C_SET_ACK(TRUE); // Set ACK
    cADC[1] = TSYS01_I2C_RECEIVE_BYTE(void) // Read next byte
    I2C_SET_ACK(TRUE); // Set ACK
    cADC[2] = TSYS01_I2C_RECEIVE_BYTE(void) // Read next byte
    I2C_SET_ACK(TRUE); // Set ACK
    cADC[3] = TSYS01_I2C_RECEIVE_BYTE(void) // Read last byte
    I2C_SET_ACK(FALSE); // Set NACK
    TSYS01_I2C_STOP(); // Send Stop Condition
}

```

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```

/*****
*      Function:      TSYS01_I2C_START                                *
*      Input:         ---                                           *
*      Return:        ---                                           *
*      Description:   Send I2C Start Condition                      *
*****/
void TSYS01_I2C_START(void)
{
    I2C_SCK_DIR = OUT;                // SCK = Output
    I2C_SDA_DIR = OUT;                // SDA = Output

    I2C_SCK = 1;
    I2C_SDA = 1;
    I2C_SDA = 0;
}

/*****
*      Function:      TSYS01_I2C_STOP                                *
*      Input:         ---                                           *
*      Return:        ---                                           *
*      Description:   Send I2C Stop Condition                      *
*****/
void TSYS01_I2C_STOP(void)
{
    I2C_SCK_DIR = OUT;                // SCK is Output
    I2C_SDA_DIR = OUT;                // SDA is Output

    I2C_SCK = 1;
    I2C_SDA = 0;
    I2C_SDA = 1;
}

```

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```

/*****
*      Function:      TSYS01_I2C_TRANSMIT_BYTE      *
*      Input:         char cTransmit      Byte to be send to TSYS01 *
*      Return:        ---                      *
*      Description:    Sends one byte to TSYS01      *
*****/
void TSYS01_I2C_TRANSMIT_BYTE(char cTransmit)
{
    char cBit, cMask;
    cMask = 0x80;

    I2C_SCK_DIR = OUT;                // SCK is Output
    I2C_SDA_DIR = OUT;                // SDA is Output

    I2C_SCK = 0;
    for (cBit = 0; cBit < 8; cBit++)
    {
        I2C_SDA = 0;
        if ((cTransmit & cMask) != 0)    I2C_SDA = 1;
        I2C_SCK = 1;
        I2C_SCK = 0;
        cMask = cMask >> 1;
    }
}

/*****
*      Function:      TSYS01_I2C_RECEIVE_BYTE
*      Input:         ---
*      Return:        char cReceiveByte received from TSYS01
*      Description:    Reads one byte from TSYS01
*****/
char TSYS01_I2C_RECEIVE_BYTE(void)
{
    char cReceive, cBit;

    I2C_SCK_DIR = IN;                // SCK is Input
    I2C_SDA_DIR = IN;                // SDA is Input

    while (I2C_SCK == 0);            // Wait for SCL release

    I2C_SCK_DIR = OUT;                // SCK is Output

    I2C_SCK = 0;
    I2C_SCK = 1;
    for (cBit = 0; cBit < 8; cBit++)
    {
        cReceive = cReceive << 1;
        I2C_SCK = 1;
        if (I2C_SDA == 1)    cReceive = cReceive + 1;
        I2C_SCK = 0;
    }
    return cReceive;
}

```

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```

/*****
*      Function:      TSYS01_I2C_GET_ACK                      *
*      Input:         ---                                    *
*      Return:        bit bACK      Bit represents ACK status *
*      Description:   Reads Acknowledge from TSYS01          *
*****/
bit TSYS01_I2C_GET_ACK(void)
{
    bit bACK;

    I2C_SCK_DIR = OUT;                // SCK is Output
    I2C_SDA_DIR = IN;                 // SDA is Input

    I2C_SCK = 0;
    I2C_SCK = 1;
    bACK = I2C_SDA;
    I2C_SCK = 0;
    return bACK;
}

/*****
*      Function:      TSYS01_I2C_Set_ACK                      *
*      Input:         bit bACK      Bit represents ACK status to be send
*      Return:        ---
*      Description:   Reads Acknowledge from TSYS01          *
*****/
void I2C_SET_ACK(bit bACK)
{
    I2C_SCK_DIR = OUT;                // SCK is Output
    I2C_SDA_DIR = OUT;               // SDA is Output

    I2C_SCK = 0;
    I2C_SDA = bACK;
    I2C_SCK = 1;
    I2C_SCK = 0;
}

```



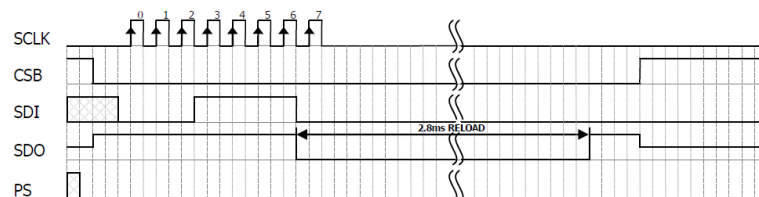
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## INTERFACE TRANSMISSIONS

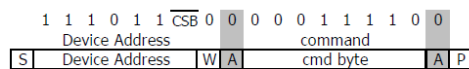
### RESET SEQUENCE

The Reset sequence has to be sent once after power-on. It can be also used to reset the device ROM from an unknown condition.

#### SPI



#### I<sup>2</sup>C

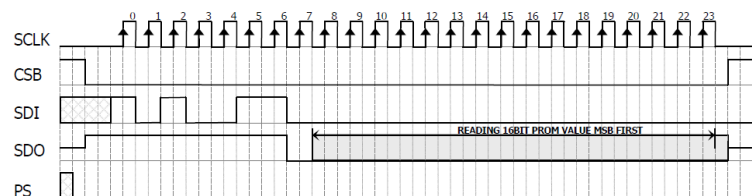


☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge

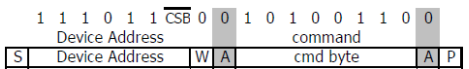
### PROM READ SEQUENCE

The PROM Read command consists of two parts. First command sets up the system into PROM read mode. The second part gets the data from the system. Below examples are sequences to read address 3 (command 0xA6).

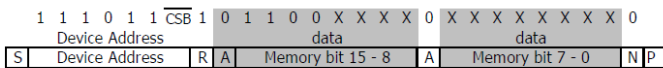
#### SPI



#### I<sup>2</sup>C



☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge



☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge

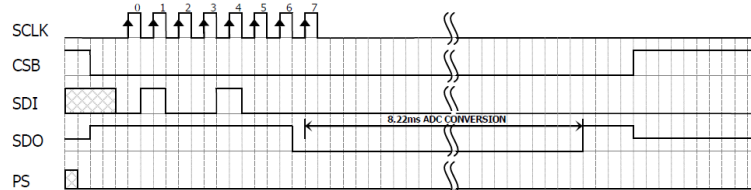
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## CONVERSION SEQUENCE

A conversion has to be started by sending this command. The sensor stays busy until conversion is done. When conversion is finished the data can be accessed by using ADC read command

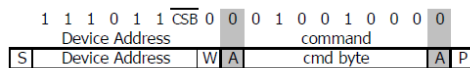
### SPI

The last clock will start the conversion which TSYS01 indicates by pulling SDO low. SDO goes high when conversion is completed.



### I<sup>2</sup>C

When the command is sent the TSYS01 stays busy until the conversion is done. All other commands except the reset command will not be executed during this time. When the conversion is finished the data can be accessed by sending a ADC read command, when an acknowledge appears from TSYS01.

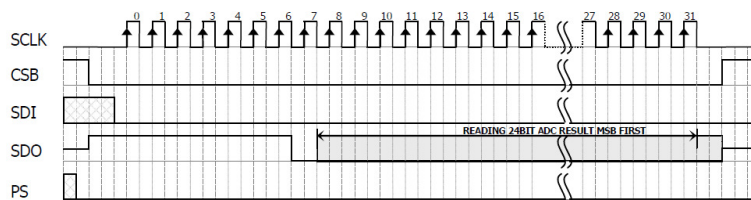


☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge

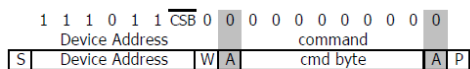
## READ ADC RESULT

After the conversion command the ADC result is read using ADC read command. Repeated ADC read commands, or command executed without prior conversion will return all 0 as result.

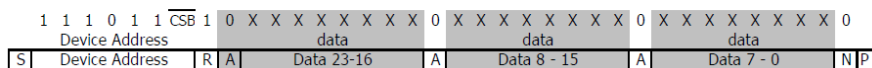
### SPI



### I<sup>2</sup>C



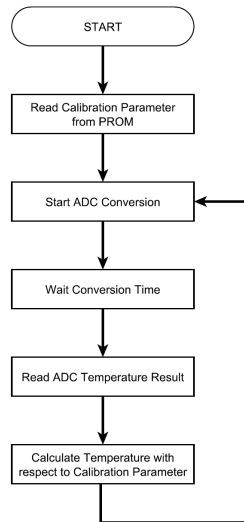
☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge



☐ From Master      S = Start Condition      W = Write      A = Acknowledge  
☒ From Slave      P = Stop Condition      R = Read      N = Not Acknowledge

# Application Note TSYS01

## TEMPERATURE CALCULATION



### CALIBRATION PARAMETER

Variable	Description	Command	Size / bit	Min	Max	Example
k <sub>4</sub>	Coefficient k <sub>4</sub> of polynomial	0xA2	16	0	65535	28446
k <sub>3</sub>	Coefficient k <sub>3</sub> of polynomial	0xA4	16	0	65535	24926
k <sub>2</sub>	Coefficient k <sub>2</sub> of polynomial	0xA6	16	0	65535	36016
k <sub>1</sub>	Coefficient k <sub>1</sub> of polynomial	0xA8	16	0	65535	32791
k <sub>0</sub>	Coefficient k <sub>0</sub> of polynomial	0xAA	16	0	65535	40781

### TEMPERATURE POLYNOMIAL

ADC24: ADC value  
ADC16: ADC24 / 256

$$T / ^\circ\text{C} = (-2) \cdot k_4 \cdot 10^{-21} \cdot \text{ADC16}^4 + 4 \cdot k_3 \cdot 10^{-16} \cdot \text{ADC16}^3 + (-2) \cdot k_2 \cdot 10^{-11} \cdot \text{ADC16}^2 + 1 \cdot k_1 \cdot 10^{-6} \cdot \text{ADC16} + (-1.5) \cdot k_0 \cdot 10^{-2}$$

### EXAMPLE

ADC24: 9378708  
ADC16: 9378708 / 256 = 36636

$$T / ^\circ\text{C} = (-2) \cdot 28446 \cdot 10^{-21} \cdot 36636^4 + 4 \cdot 24926 \cdot 10^{-16} \cdot 36636^3 + (-2) \cdot 36016 \cdot 10^{-11} \cdot 36636^2 + 1 \cdot 32791 \cdot 10^{-6} \cdot 36636 + (-1.5) \cdot 40781 \cdot 10^{-2}$$

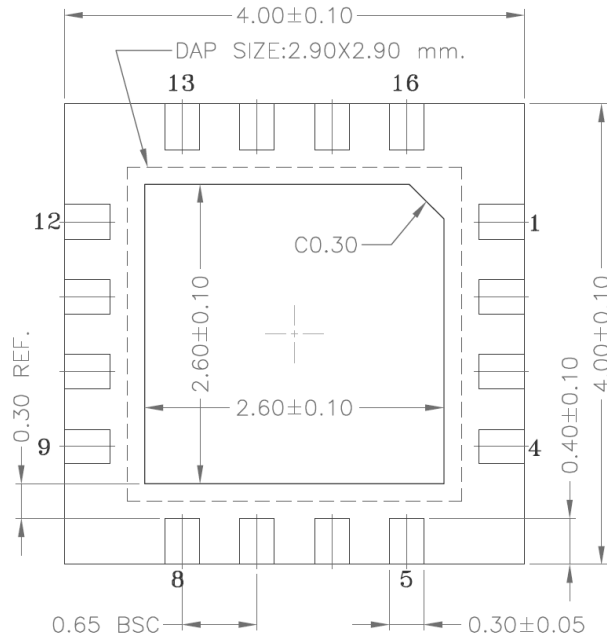
$$T / ^\circ\text{C} = \underline{10.55}$$



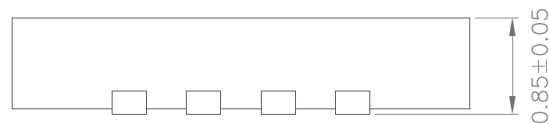
# Application Note TSYS01

## DIMENSIONS

### BOTTOM VIEW

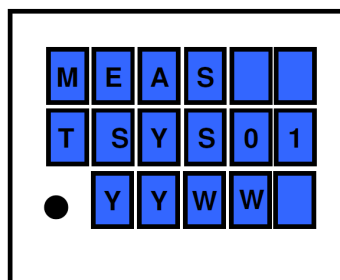


### SIDE VIEW



## MARKING

Line	Description	Example
1	Manufacturer	MEAS
2	Product Name	TSYS01
3	Pin 1 Dot, Date Code YYWW	1141



# Application Note TSYS01

## ORDER INFORMATION

Please order this product using following:

Part Number  
G-NICO-018

Part Description  
TSYS01 Digital Temperature Sensor

## EMC

Due to the use of these modules for OEM application no CE declaration is done.

Especially line coupled disturbances like surge, burst, HF etc. cannot be removed by the module due to the small board area and low price feature. There is no protection circuit against reverse polarity or over voltage implemented.

The module will be designed using capacitors for blocking and ground plane areas in order to prevent wireless coupled disturbances as good as possible.

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