

*SENSYLINK Microelectronics*

*(CT1820)*

*Single-Wire Digital Temperature Sensor*

***CT1820 is a Digital Temperature Sensor with  $\pm 0.5^{\circ}\text{C}$  Accuracy  
Compatible with 1-wire Interface.  
It is ideally used in HVAC, Thermal management and Smart Farm  
etc.***

# ±0.5 °C Temperature Sensor with Single-Wire Digital Interface

## Description

CT1820 is a digital temperature sensor with ±0.5°C accuracy. Temperature data can be read out directly via Single-Wire interface (compatible with 1-wire bus in protocol) by MCU.

It includes a high precision band-gap circuit, a 12-bit analog to digital converter that can offer 0.0625°C resolution, a calibration unit with non-volatile memory, 8-bit CRC generator and a digital interface block.

The chip is specially calibrated for ±0.5°C(Max.) accuracy over -10°C to 85°C range in factory before shipment to customers.

Each chip has a unique 64-bit ROM ID, which allows multiple devices to connect the same Single-Wire bus. MCU can distinguish and access each device individually by different ROM ID.

Also each chip has 3 bytes RFU (Reserved for User) scratchpad registers; User can store specific data into OTP memory by write memory command.

It has programmable temperature Alarm function for upper and lower trigger temperature.

Available Package: TO-92 package

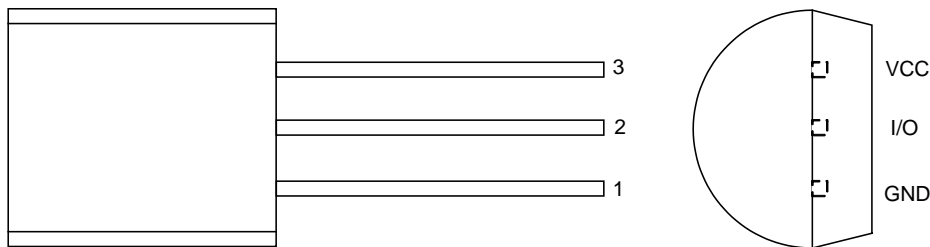
## Features

- Operation Voltage: 3.0V to 5.5V
- Average Quiescent Current: 30uA during Temperature conversion; Standby Current: 5.0uA (Max.)
- Temperature Conversion time less than 40ms at 12-bit resolution
- Temperature Accuracy without calibration:
  - ±0.5°C(Max.) from -10°C to 85°C
  - ±1.0°C(Max.) from -10°C to 100°C
  - ±2.0°C(Max.) from -55°C to 125°C
- 12 bit ADC for 0.0625°C resolution
- Compatible with 1-wire interface
- Programmable Upper/Lower trigger Temperature
- Compatible with DS18B20 and performance improved.
- Temperature Range: -55°C to 125°C

## Applications

- Smart HVAC System
- Thermal Management
- Smart Farm

## PIN Configurations (Top View)



TO-92 (package code Z)

## Typical Application

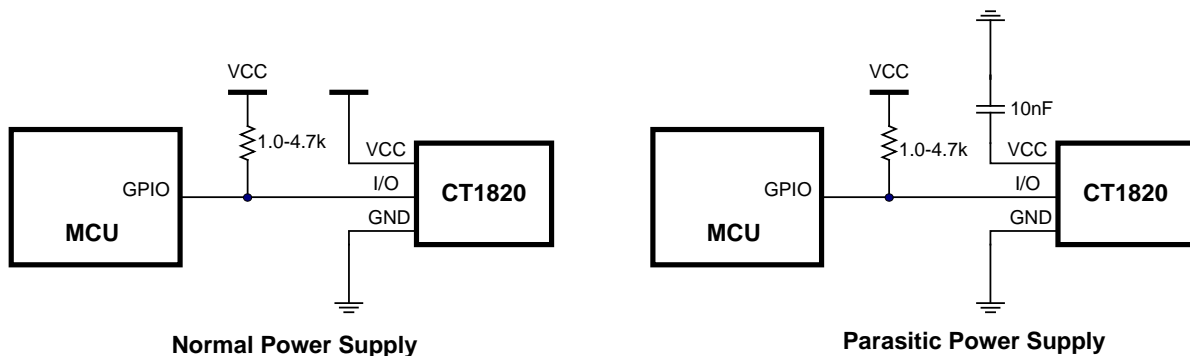


Figure 1. Typical Application of CT1820

## ±0.5 °C Temperature Sensor with Single-Wire Digital Interface

### Pin Description

PIN No.	PIN Name	Description
1	GND	Ground pin.
2	I/O	Digital interface data input and output pin, Generally there needs a pull-up resistor to VCC in most applications, between 1.0k and 4.7k. Also this pin can be used as parasitic power pin if there is no power from VCC pin.
3	VCC	Power supply input pin, if I/O pin is used as parasitic power pin, VCC pin should connect a 10nF ceramic cap at least to ground.

### Function Block

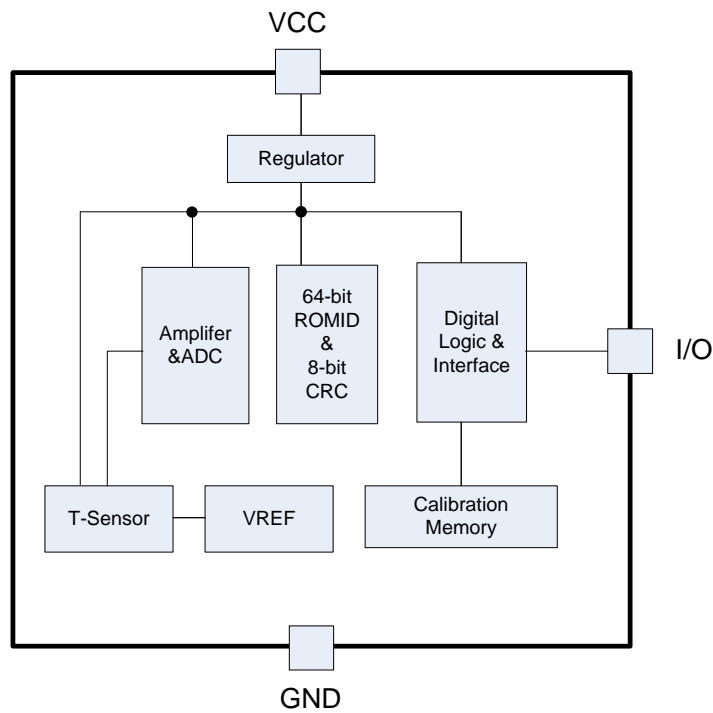
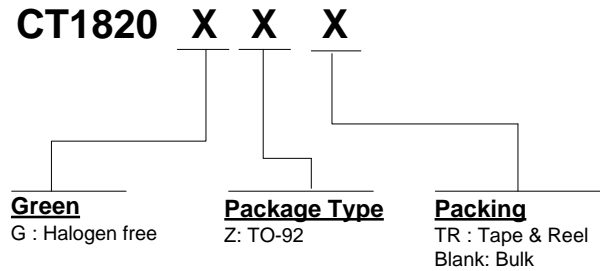


Figure 2. CT1820 function block

**±0.5 °C Temperature Sensor with Single-Wire Digital Interface**
**Ordering Information**


Order PN	Accuracy	Green <sup>1</sup>	Package	Marking ID <sup>2</sup>	Packing	MPQ	Operation Temperature
CT1820GZ	±0.5°C	Halogen free	TO-92	1820 YWWA	Bulk	1,000	-55°C~+125°C
CT1820GZTR	±0.5°C	Halogen free	TO-92	1820 YWWA	Tape & Reel	2,000	-55°C~+125°C

**Notes**

1. Based on ROHS Y2012 spec, Halogen free covers lead free. So most package types Sensylink offers only states halogen free, instead of lead free.

2. Marking ID includes 2 rows of characters. In general, the 1<sup>st</sup> row of characters are part number, and the 2<sup>nd</sup> row of characters are date code plus production information.

- 1) Generally, date code is represented by one number and one letter. The number stands for year information, e.g. 5 stands for year 2015; 6 stands for year 2016. The capital letter (A-Z) stands for week information, e.g. A stands for 1<sup>st</sup> - 2<sup>nd</sup> week; B stands for 3<sup>rd</sup> - 4<sup>th</sup> week, and so on. Z stands for 51<sup>st</sup> - 54<sup>th</sup> week.
- 2) Right after the date code information, the next 2-3 numbers or letters are specified to stand for supplier or production location information.

## ±0.5 °C Temperature Sensor with Single-Wire Digital Interface

### Absolute Maximum Ratings (Note 3)

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$ to GND	-0.3 to 5.5	V
I/O pin Voltage	$V_{IO}$ to GND	-0.3 to 5.5	V
Operation junction temperature	$T_J$	-50 to 150	°C
Storage temperature Range	$T_{STG}$	-65 to 150	°C
Lead Temperature (Soldering, 10 Seconds)	$T_{LEAD}$	260	°C
ESD MM	$ESD_{MM}$	600	V
ESD HBM	$ESD_{HBM}$	6000	V
ESD CDM	$ESD_{CDM}$	1000	V

#### Note 3

- Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at the "Absolute Maximum Ratings" conditions or any other conditions beyond those indicated under "Recommended Operating Conditions" is not recommended. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.
- Using 2oz dual layer (Top, Bottom) FR4 PCB with 4x4 mm<sup>2</sup> cooper as thermal PAD

### Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	3.0 ~ 5.0	V
Ambient Operation Temperature Range	$T_A$	-55 ~ +125	°C

## ±0.5 °C Temperature Sensor with Single-Wire Digital Interface

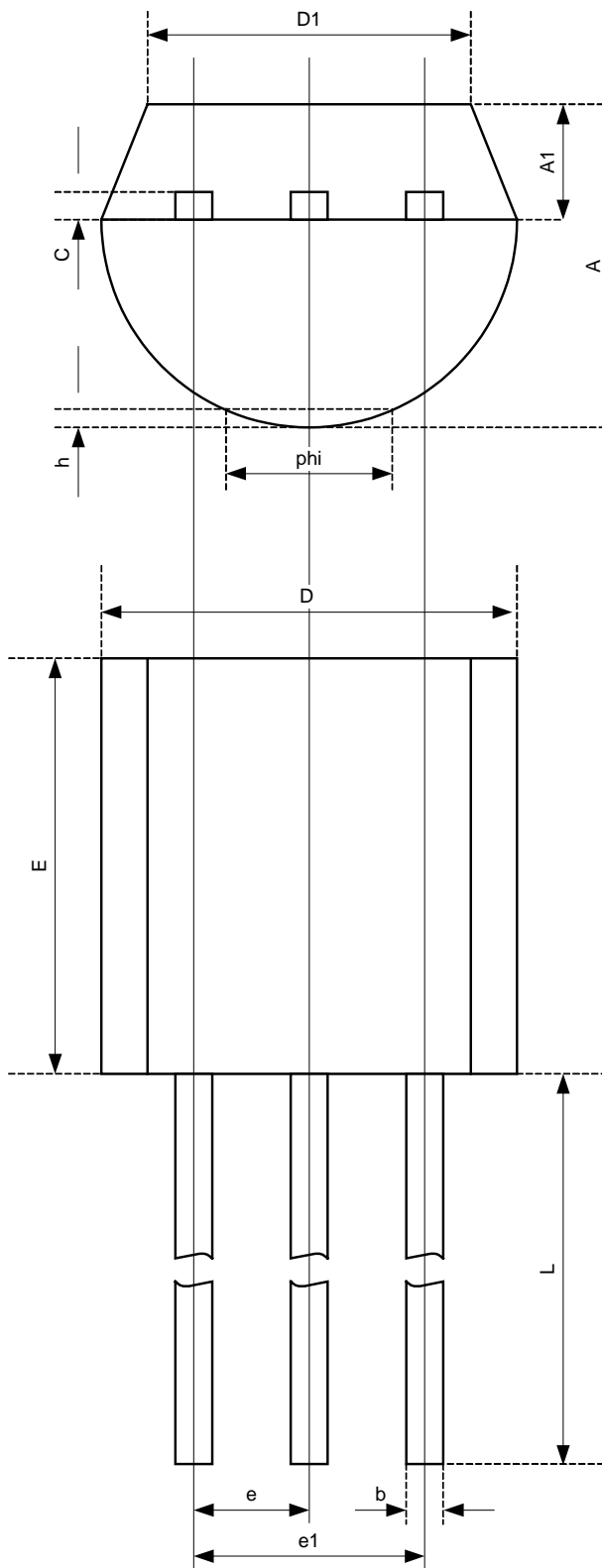
### Electrical Characteristics (Note 4)

Test Conditions:  $V_{CC} = 3.0V$  to  $5.0V$ ,  $T_A = -10$  to  $85^\circ C$  unless otherwise specified. All limits are 100% tested at  $T_A = 25^\circ C$ .

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$		3.0		5.0	V
Temperature Accuracy	$T_{AC}$	$T_A = -10$ to $85^\circ C$	-0.5		0.5	$^\circ C$
		$T_A = -10$ to $100^\circ C$	-1.0		1.0	$^\circ C$
		$T_A = -55$ to $125^\circ C$	-2.0		2.0	$^\circ C$
Temperature Resolution			0.0625			$^\circ C$
Average Operating Current	$I_{AOC}$	$V_{IN} = 3.3V$ , during Temperature conversion		40		$\mu A$
Shutdown Current	$I_{SHUTDOWN}$	Idle, not temperature conversion			5.0	$\mu A$
Conversion time	$t_{CON}$	From active to finish completely		20	40	ms
<b>Digital Interface</b>						
Logic Input Capacitance	$C_{IL}$	I/O pin		20		pF
Logic Input High Voltage	$V_{IH}$	I/O pin	1.0		$V_{CC} - 1.5V$	V
Logic Input Low Voltage	$V_{IL}$	I/O pin	0		0.5	V
Logic Input Current	$I_{INL}$	I/O pin	-2.0		2.0	$\mu A$
<b>Communication Timing</b>						
Single-Wire Communication Clock	$T_{CLK}$	default mode, [T2:T1:T0=1:1:1]		24		$\mu s$
Recovery time	$t_{REC}$		3.0			$\mu s$
Time slot for "0" or "1"	$t_{SLOT}$		$4 * T + t_{REC}$			$\mu s$
Power-on Reset Low Time	$t_{POR}$		2000			$\mu s$
Power-on Reset High Response Time	$t_{EXR}$		200			$\mu s$
Power-on Reset Low Response Time	$t_{POROK}$			$12 * T$		$\mu s$
Power-on Reset Response Sampling Time	$t_{HSP\_POR}$		200		$200 + 12 * T$	$\mu s$
Device Reset Low Time	$t_{RESET}$			$32 * T$		$\mu s$
Device Reset High Response Time	$t_{PDH}$			$2 * T$		$\mu s$
Device Reset Low Response Time	$t_{PDL}$			$8 * T$		$\mu s$
Device Reset Response Sampling Time	$t_{HSP}$		$2 * T$		$10 * T$	$\mu s$
Write '0' Low Time'	$t_{W0L}$		$4 * T$		$8 * T$	$\mu s$
Write '1' Low Time'	$t_{W1L}$		2.0		$1 * T$	$\mu s$
Read bit Low Time	$t_{RL}$		2.5		$1 * T$	$\mu s$
Read bit sampling Time	$t_{HSR}$		$t_{RL}$		$2 * T$	$\mu s$
OTP Program Current	$I_{PROG}$		3.2		4.8	mA
OTP Program Time	$t_{PROG}$		200	300	400	$\mu s$
OTP Program Voltage	$V_{PROG}$		7.25	7.5	7.75	V
Data Retention	$t_{DR}$		10			Years

#### Note 4:

- All devices are 100% production tested at  $T_A = +25^\circ C$ ; All specifications over the automotive temperature range is guaranteed by design, not production tested.
- No parasitic diode between EN pin and VIN pin.

**Package Outline Dimensions**
**TO-92 Unit (mm)**


Symbol	Min.	Max.
A	3.30	3.70
A1	1.10	1.40
b	0.38	0.55
c	0.36	0.51
D	4.30	4.70
D1	3.43	
E	4.30	4.70
e1	2.44	2.64
L	14.10	14.50
Phi		1.60
h	0.00	0.38
e	1.27	



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