SENSYLINK Microelectronics

(CT7428)

8-CH Remote and 1-CH Local Temperature Sensor

CT7428 is a 9-channels (8-channels Remote and 1-channel Local) Temperature Sensor with ±1°C Accuracy and SMBus Digital Interface.

It is ideally used in Temperature Sensing and Monitoring Systems, such as Computer, Server and Telecom Equipment System etc.

±1ºC 9-CH (8-CH Remote and 1-CH Local) Digital Temperature Sensor

Description

The CT7428 is a 9channels digital temperature sensor with ±1ºC accuracy. Temperature data can be read out directly via SMBus/I2C interface by MCU or SoC chip.

CT7428 has 9 independent channels: 8 remote channels and 1 local channel. The remote channels could be connected to an external Diode, BJT transistor (diode-connected mode), or parasitic PNP BJT transistor inside the CPU, FPGA or SOC chip. Based on this, this chip can be used to monitor CPU, GPU, MCU, SOC, FPGA or DSP chip die and case temperature.

Each chip is calibrated in factory before shipment to customers. There is no need for re-calibration anymore for ±1ºC accuracy. The chip builds in a band-gap circuit, an analog to digital converter, a calibration unit with non-volatile memory and a digital interface block.

It integrates a 13-bit ADC, which can offer 0.0625ºC resolution and -50ºC to 150ºC temperature range. There are 2 individual thermal limit registers for each channel, which can be programmed from -255ºC to 255ºC range with 0.5ºC step as threshold temperature. It has 2 logic THERM output pins($\overline{\text{THERM}}$, $\overline{\text{THERM2}}$) with open drain structure and active low.

Available Package:QFN3x3-16.

Features

- Operation Voltage: 1.7V to 5.5V
- Average Operating Current: 45uA (Typ.)for all channels one time measurement at VCC = 3.3V
- Standby Current: 3.0uA (Typ.)
- Temperature Accuracy without calibration for all channels:±1ºC from 0ºC to 50ºC
- 13 bit ADC for 0.0625ºC resolution
- Digital interface compatible with SMBus and I2C
- PEC feature to improve communication reliability and robustness
- Series Resistance Cancellation, n-Factor correction, Offset correction and Diode fault detection for each remote channel.
- Individually programmable THERM limit temperature for any of 9 channels with share Hysterisis data
- Register lock feature to protection register data
- 8 slave addresses available by setting AD0 pin
- Temperature Range:
  -40ºC to 125ºC for sensor chip
  -50ºC to 150ºC for remote diodes

Applications

- MCU, CPU, GPU, SOC, FPGA or DSP die or case Temperature monitor
- Desktop &Notebook Computer, Server
- Telecom Equipment

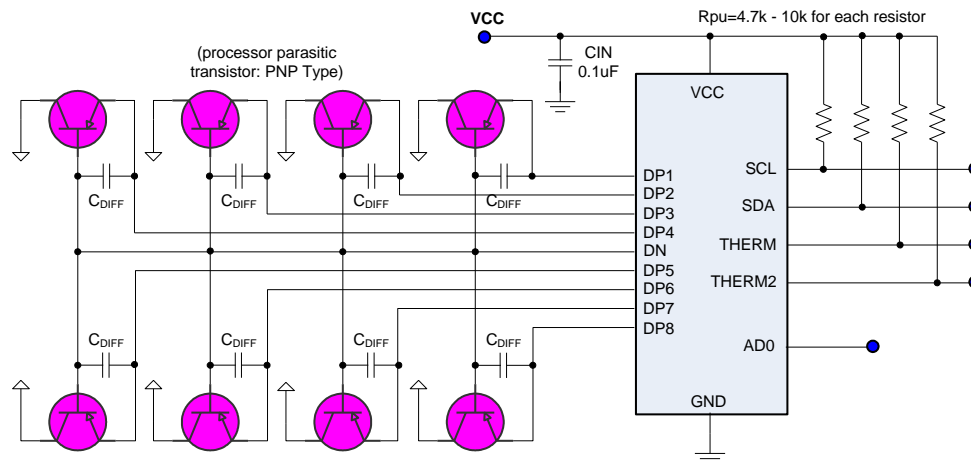## PIN Configurations (Top View)
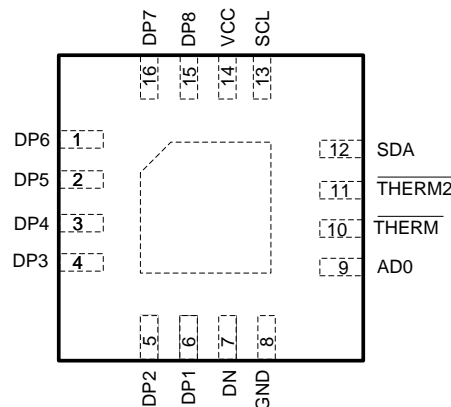
QFN3x3-16 (Package Code, QN)

±1°C 9-CH (8-CH Remote and 1-CH Local) Digital Temperature Sensor

Typical Application

Figure 1. Typical Application of CT7428

Pin Description

PIN No.	PIN Name	Description
1	DP6	Remote channel 6 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP6 and DN pin.
2	DP5	Remote channel 5 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP5 and DN pin.
3	DP4	Remote channel4 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP4 and DN pin.
4	DP3	Remote channel3 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP3 and DN pin.
5	DP2	Remote channel2 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP2 and DN pin.
6	DP1	Remote channel1 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP1 and DN pin.
7	DN	Remote channel common negative input pin, it could be negative node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP1 to DP8pins and this pin respectively.
8	GND	Ground pin.

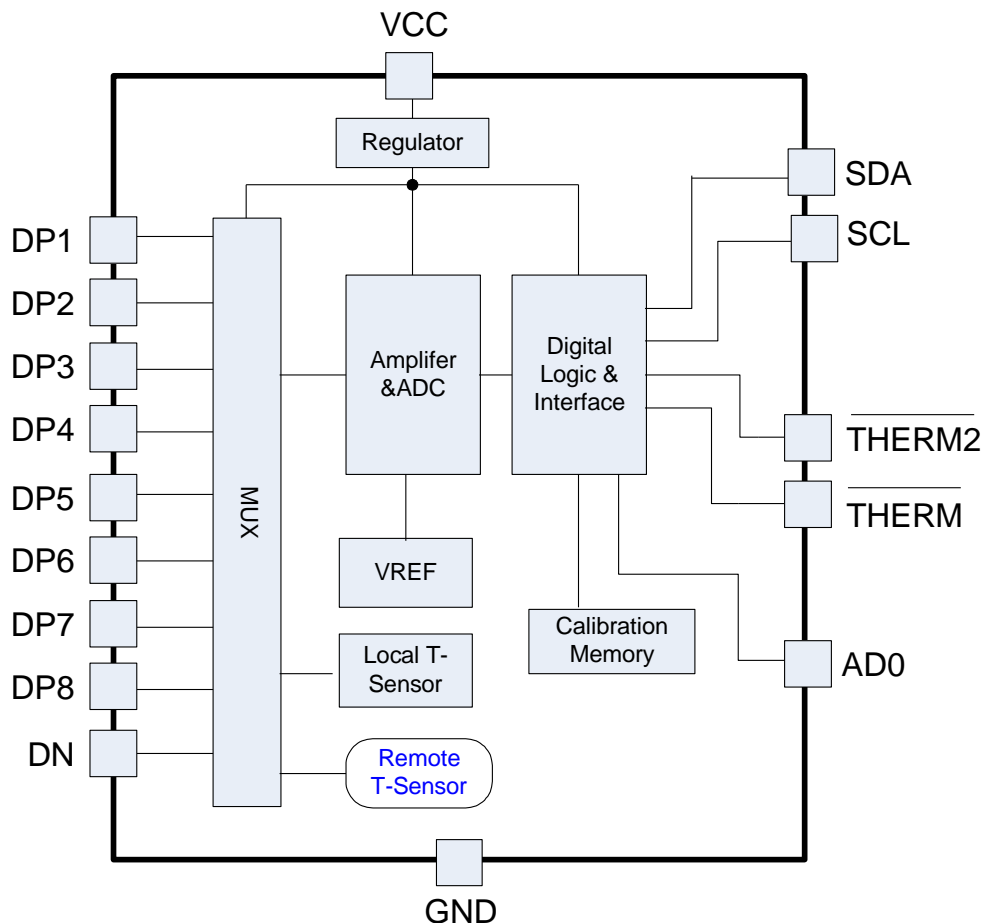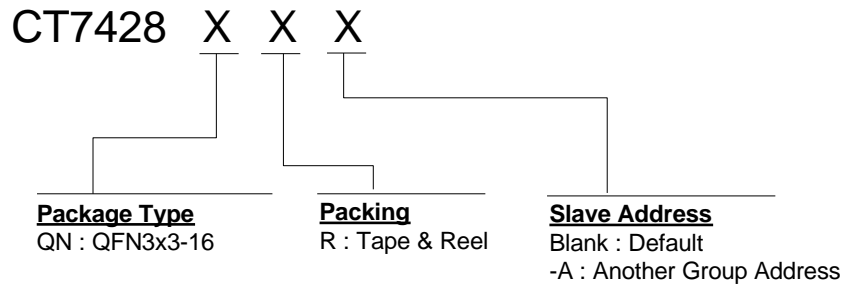| 9	AD0	Slave address setup pin, it will generate 4 different slave addresses by connecting to VCC, GND, SCL and SDA. For suffix -A part, there will generate another 4 different slave addresses by connecting AD0 pin to VCC, GND, SCL and SDA. Total there is 8 slave addresses for selection.
10	$\overline{\text{THERM}}$	Open drain output with active low. Need a pull-up resistor to VCC If the measured temperature meets or exceeds THERM-limit (programmable by user), this pin will be activated. This pin can be used to control Fan on/off.
11	$\overline{\text{THERM2}}$	Another THERM (THERM2) pin, it is also open drain output with active low. Need a pull-up resistor to VCC If the measured temperature meets or exceeds THERM2-limit (programmable by user), this pin will be activated.
12	SDA	Digital interface data input or output pin, need a pull-up resistor to VCC.
13	SCL	Digital interface clock input pin, need a pull-up resistor to VCC.
14	VCC	Power supply input pin, using 0.1uF low ESR ceramic capacitor to ground
15	DP8	Remote channel 8 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP8 and DN pin.
16	DP7	Remote channel 7 positive input pin, it could be positive node of Diodes, or BJT transistor (diode-connected mode). It is recommended to use bypass capacitor (C_{DIFF}< 1000pF) plus serial resistor (R_S< 1.0k ohm) to remove noise between DP7 and DN pin.

Function Block

Figure 2. CT7428 function block

Ordering Information (Note 1)

CT7428 X X X

Package Type
QN : QFN3x3-16

Packing
R : Tape & Reel

Slave Address
Blank : Default
-A : Another Group Address

Order PN	Accuracy	Green[1]	Package	Marking ID[2]	Packing	MPQ	Operation Temperature
CT7428QNR	±1ºC	Halogen free	QFN3x3-16	7428 YWWAXX	Tape & Reel	3,000	-40ºC~+125ºC
CT7428QNR-A	±1ºC	Halogen free	QFN3x3-16	7428 YWWAXX	Tape & Reel	3,000	-40ºC~+125ºC

Note 1

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 1st row of characters are part number, and the 2nd row of characters aredate code plus production information.

1) Generally, date code is represented by 3 numbers. The number stands for year and work week information. e.g. 501stands forthe first work week of year 2015;621 stands for the 21st work week of year 2016.

2) Right after the date code information, the next 2-3 numbers or letters are specified to stands for supplier or production location information.

3. Slave Address, See 1.5.1 Slave address Section for detail.

SENSYLINK Microelectronics Inc.

www.sensylink.com

IMPORTANT NOTICE