SENSYLINK Microelectronics

(CT7305)

Digital Temperature Sensor

CT7305 is a Digital Temperature Sensor with ±0.5°C Accuracy Compatible with SMBus, I^2C and 2-wire Interface.
It is ideally used in HVAC, Thermal management and Portable Devices etc.

$\pm 0.5\,^{\circ}\text{C}$ Digital Temperature Sensor with Digital Interface

Description

CT7305 is a digital temperature sensor with $\pm 0.5\,^{\circ}\text{C}$ accuracy. Temperature data can be read out directly via digital interface (compatible with SMBus, I^2C or 2-wire) by MCU or SoC chip.

CT7305 supports I^2C communication with speed up to High Speed Mode (3.4 MHz).

Each chip is specially calibrated for $\pm 0.5\,^{\circ}\text{C}$(Max.) accuracy over $0\,^{\circ}\text{C}$ to $85\,^{\circ}\text{C}$ range in factory before shipment to customers. There is no need for re-calibration anymore for $\pm 0.5\,^{\circ}\text{C}$ accuracy.

It includes a high precision band-gap circuit, a 13-bit analog to digital converter that can offer $0.03125\,^{\circ}\text{C}$ resolution, a calibration unit with non-volatile memory, and a digital interface block.

It has ALERT logic output pin with open drain structure, which is selectable for active low or high by programming. ALERT response is compatible with SMBus ALERT Response Address (ARA).

Available Package: SOP-8 and DFN-3x3-8 package

Features

- Operation Voltage: 3.0V to 5.5V
- Average Quiescent Current: 10uA at 4.0 con/s;
- Standby Current: 1.5uA (Max.)
- Temperature Accuracy without calibration: Maximum: $\pm 0.5\,^{\circ}\text{C}$ from $0\,^{\circ}\text{C}$ to $85\,^{\circ}\text{C}$ Maximum: $\pm 1.0\,^{\circ}\text{C}$ from $-40\,^{\circ}\text{C}$ to $125\,^{\circ}\text{C}$
- 13 bit ADC for $0.03125\,^{\circ}\text{C}$ resolution
- Compatible with SMBus, 2-wire and I^2C interface
- Programmable Over/Under Temperature
- Programmable Active Low or High for ALERT pin
- Support SMBus ALERT Response Address(ARA)
- Generate 4 different slave address by AD0 pin
- Temperature Range: $-40\,^{\circ}\text{C}$ to $125\,^{\circ}\text{C}$
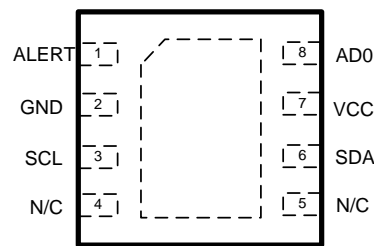
Applications

- Smart HVAC System
- Thermal Management
- Portable Device

PIN Configurations (Top View)
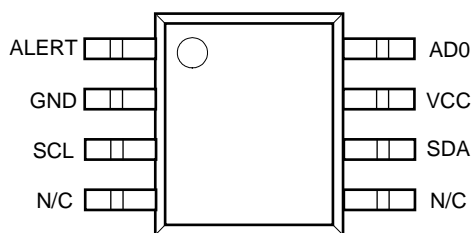
SOP-8(Package Code M)
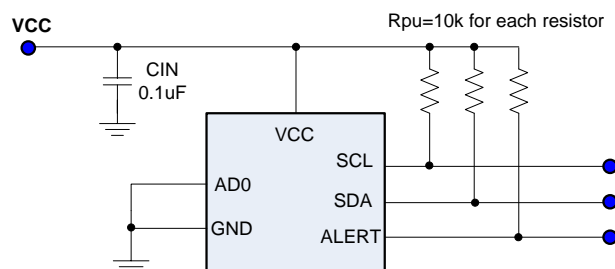
DFN-3x3-8 (package code DN)

Typical Application

Figure 1. Typical Application of CT7305

Pin Description

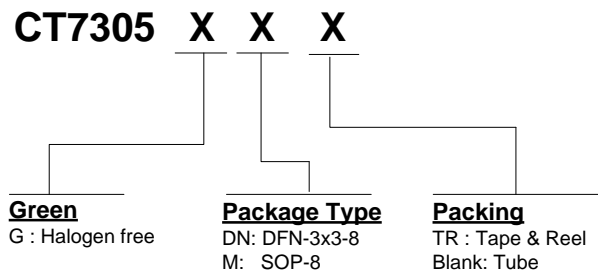| PIN No.	PIN Name	Description
1	ALERT	To Indicate ALERT of over or under Temperature programmed by setting T_{HIGH}/T_{LOW} register, it is open drain output with programmable active low or high. Need a pull-up resistor to VCC in application.
2	GND	Ground pin.
3	SCL	Digital interface clock input pin, need a pull-up resistor to VCC.
4	N/C	Not connected.
5	N/C	Not connected.
6	SDA	Digital interface data input or output pin, need a pull-up resistor to VCC.
7	VCC	Power supply input pin, using 0.1uF low ESR ceramic capacitor to ground
8	AD0	Address selection pin, the chip can be defined 4 different slave address by connection AD0 pin to GND, VCC, SCL or SDA pin. see 1.5.1 **Slave Address**

Function Block
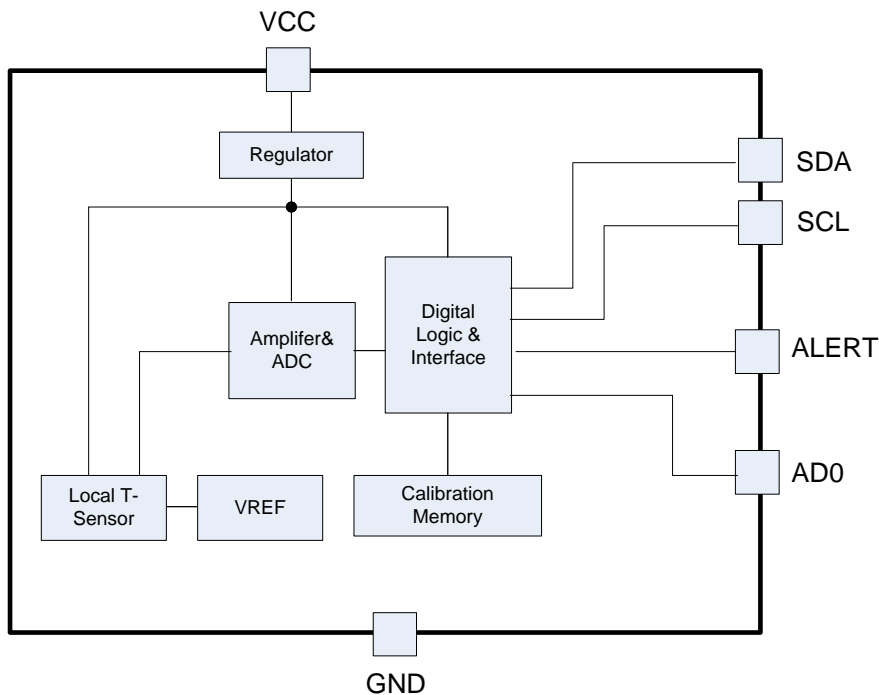
Figure 2. CT7305 function block

±0.5 °C Digital Temperature Sensor with Digital Interface

Ordering Information

CT7305　X　X　X

Green
G : Halogen free

Package Type
DN: DFN-3x3-8
M: SOP-8

Packing
TR : Tape & Reel
Blank: Tube

Order PN	Accuracy	Green[1]	Package	Marking ID[2]	Packing	MPQ	Operation Temperature
CT7305GDNTR	±0.5^{o}C	Halogen free	DFN-3x3-8	7305 YWWA	Tape & Reel	5,000	-40°C~+125°C
CT7305GM	±0.5^{o}C	Halogen free	SOP-8	7305 YWWA	Tube	32,000	-40°C~+125°C
CT7305GMTR	±0.5^{o}C	Halogen free	SOP-8	7305 YWWA	Tape & Reel	2,500	-40°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 1st row of characters are part number, and the 2nd 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 1st - 2nd week; B stands for 3rd - 4th week, and so on. Z stands for 51st - 54th week.

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

Absolute Maximum Ratings (Note 3)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC} to GND	-0.3 to 5.5	V
SDA, SCL, AD0 Voltage	$V_{SDA}/V_{SCL}/V_{AD0}$ to GND	-0.3 to 5.5	V
ALERT Voltage	V_{ALERT} to GND	-0.3 to 5.5	V
Operation junction temperature	T_J	-50 to 150	ºC
Storage temperature Range	T_{STG}	-65 to 150	ºC
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260	ºC
ESD MM	ESD_{MM}	600	V
ESD HBM	ESD_{HBM}	6000	V
ESD CDM	ESD_{CDM}	1000	V

Note 3

1. *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.*
2. *Using 2oz dual layer (Top, Bottom) FR4 PCB with 4x4 mm^2 cooper as thermal PAD*

Recommended Operating Conditions

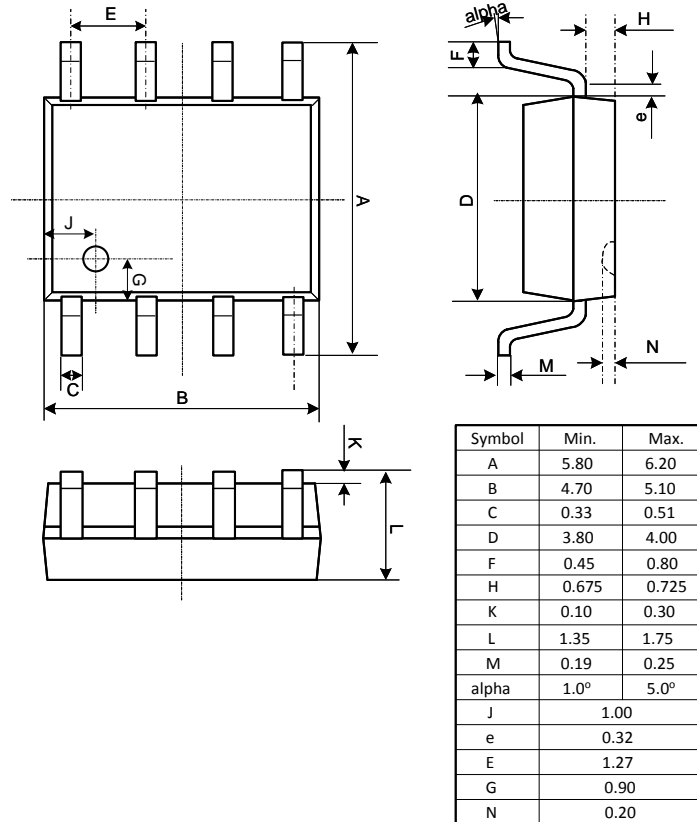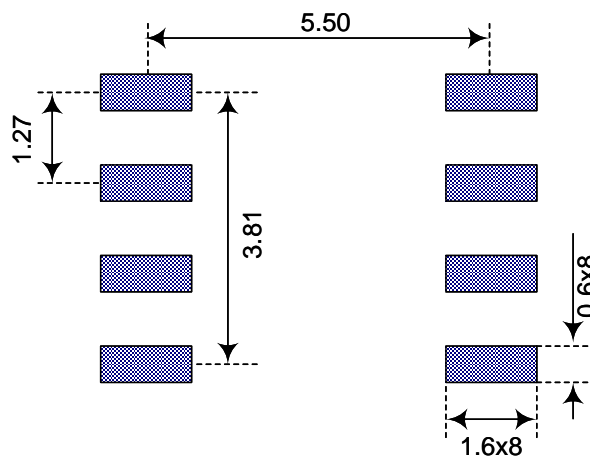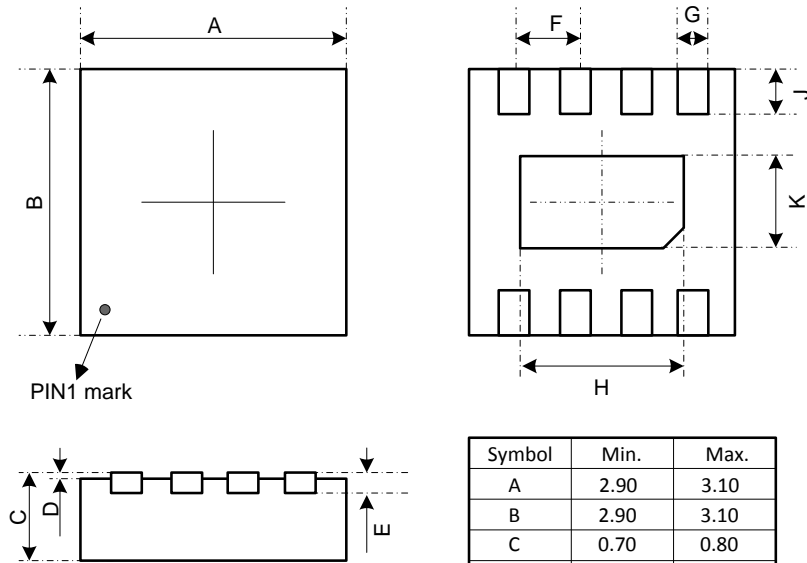| Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	3.0 ~ 5.0	V
Ambient Operation Temperature Range	T_A	-40 ~ +125	°C

Electrical Characteristics (Note 4)

Test Conditions: C_{IN} = 0.1uF, V_{CC} = 3.0V to 5.0V, T_A= -40 to 125°C unless otherwise specified. All limits are 100% tested at T_A=25°C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{CC}		3.0		5.0	V
Temperature Accuracy	T_{AC}	T_A = 0 to 85°C	-0.5		0.5	^{o}C
		T_A = -40 to 125°C	-1.0		1.0	^{o}C
Temperature Resolution		13-bit		0.03125		^{o}C
Average Operating Current	I_{AOC}	V_{IN} = 3.3V, 4.0 con/s		7.0	10.0	uA
Shutdown Current	$I_{SHUTDOWN}$	Enable STB bit, force SDA/SCL to VCC or GND			1.5	uA
Open Drain Output Voltage	V_{OL}	ALERT pin, sink 5mA	0		0.2	V
Open Drain Leakage	I_{ODL}	ALERT pin	-1.0		1.0	uA
Conversion time	t_{CON}	From active to finish completely		30		ms
Digital Interface						
Logic Input Capacitance	C_{IL}	SDA, SCL pin		3.0		pF
Logic Input High Voltage	V_{IH}	SDA, SCL pin	0.8*VCC		VCC	V
Logic Input High Voltage	V_{IL}	SDA, SCL pin	0		0.2*VCC	V
Logic Input Current	I_{INL}	SDA, SCL pin	-1.0		1.0	uA
Logic Output Sink Current	I_{OLS}	SDA, ALERT pin, forced 0.2V		5.0		mA
SCL frequency	f_{CLK}	High Speed Mode	20		3400	kHz
Timeout of detecting clock low period time	t_{TOUT}	SMBus Communication		30		ms
Clock low period time	t_{LOW}	High Speed Mode	200			ns
Clock high period time	t_{HIGH}	High Speed Mode	50			ns
Bus free time	t_{BUF}	Between Stop and Start condition	150			ns
Hold time after Start condition	$t_{HD:STA}$		150			ns
Repeated Start condition setup time	$t_{SU:STA}$		150			ns
Stop condition setup time	$t_{SU:STO}$		150			ns
Data Hold time	$t_{HD:DAT}$		20		100	ns
Data Setup time	$t_{SU:DAT}$		20			ns
Clock/Data fall time	t_F				40	ns
Clock/Data rise time	t_{SR}				40	ns

*Note 4:*

1. *All devices are 100% production tested at T_A = +25°C; All specifications over the automotive temperature range is guaranteed by design, not production tested.*

2. *No parasitic diode between EN pin and VIN pin.*

Package Outline Dimensions

SOP-8   **Unit (mm)**

Symbol	Min.	Max.
A	5.80	6.20
B	4.70	5.10
C	0.33	0.51
D	3.80	4.00
F	0.45	0.80
H	0.675	0.725
K	0.10	0.30
L	1.35	1.75
M	0.19	0.25
alpha	1.0º	5.0º
J	1.00	
e	0.32	
E	1.27	
G	0.90	
N	0.20	

Recommended PAD Layout Pattern

SOP-8   **Unit (mm)**

±0.5 °C Digital Temperature Sensor with Digital Interface

Package Outline Dimensions

DFN-3x3-8   **Unit (mm)**

PIN1 mark

Symbol	Min.	Max.
A	2.90	3.10
B	2.90	3.10
C	0.70	0.80
D	0.00	0.05
G	0.30	0.40
J	0.35	0.45
E	0.203	
F	0.65	
H	2.51	2.61
K	1.55	1.65

Recommended PAD Layout Pattern

DFN-3x3-8   **Unit (mm)**

2.60

0.65

1.95

0.35x8

0.5x8
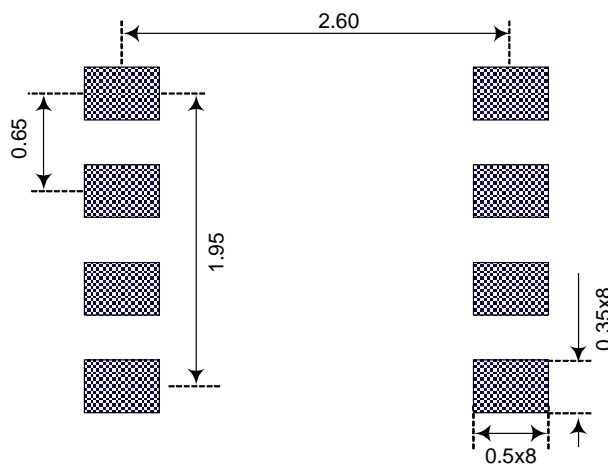
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