

## CHT-74021 DATASHEET

Revision: 03.5  
8-Jul-14  
(Last Modified Date)

## High-Temperature, Quad 2-Inputs NOR Gate

### General Description

The CHT-74021 contains four independent 2-inputs NOR gates, performing the Boolean function :

$$Y = \overline{A + B}$$

This circuit is designed assuring latchup-free operation for all supply and temperature conditions.

The CHT-74021 can operate with supply voltages from 3.3 to 5V ( $\pm 10\%$ ).

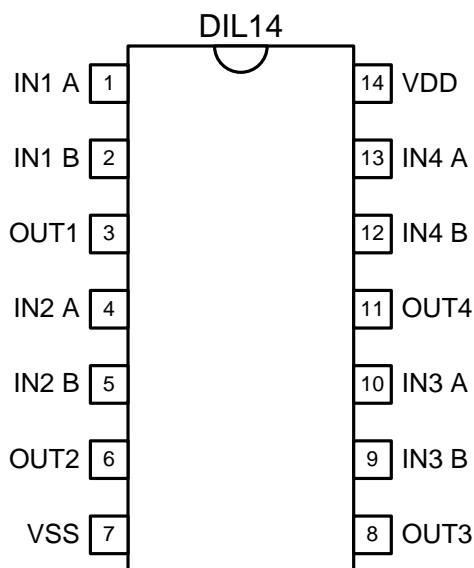
### Features

- Qualified from -55 to +225°C (Tj)
- 3.3 to 5V ( $\pm 10\%$ ) supply voltages
- Latchup-free at any supply and temperature condition
- Validated at 225°C for 30000 hours (CDIL14) and 20000 hours (CSOIC16) (and still on-going)
- Available in DIL14 and CSOIC16 hermetic standard package

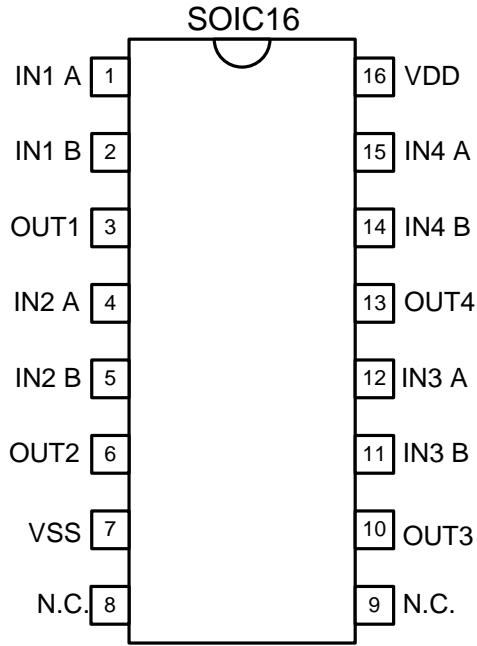
### Applications

- Well logging,
- Automotive, Aeronautics & Aerospace
- Harsh Environments

### Package and Pin Configuration



Pin	Symbol	Description
1	IN1 A	Input A of the NOR gate number 1
2	IN1 B	Input B of the NOR gate number 1
3	OUT1	Output of the NOR gate number 1
4	IN2 A	Input A of the NOR gate number 2
5	IN2 B	Input B of the NOR gate number 2
6	OUT2	Output of the NOR gate number 2
7	VSS	Circuit core ground terminal.
8	OUT3	Output of the NOR gate number 3
9	IN3 B	Input B of the NOR gate number 3
10	IN3 A	Input A of the NOR gate number 3
11	OUT4	Output of the NOR gate number 4
12	IN4 B	Input B of the NOR gate number 4
13	IN4 A	Input A of the NOR gate number 4
14	VDD	Circuit core power supply terminal.



Pin	Symbol	Description
1	IN1 A	Input A of the NOR gate number 1
2	IN1 B	Input B of the NOR gate number 1
3	OUT1	Output of the NOR gate number 1
4	IN2 A	Input A of the NOR gate number 2
5	IN2 B	Input B of the NOR gate number 2
6	OUT2	Output of the NOR gate number 2
7	VSS	Circuit core ground terminal.
8	NC	Not connected
9	NC	Not connected
10	OUT3	Output of the NOR gate number 3
11	IN3 B	Input B of the NOR gate number 3
12	IN3 A	Input A of the NOR gate number 3
13	OUT4	Output of the NOR gate number 4
14	IN4 B	Input B of the NOR gate number 4
15	IN4 A	Input A of the NOR gate number 4
16	VDD	Circuit core power supply terminal.

**Function Table**

INPUT		OUTPUT
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

**Function and Logical Diagrams**

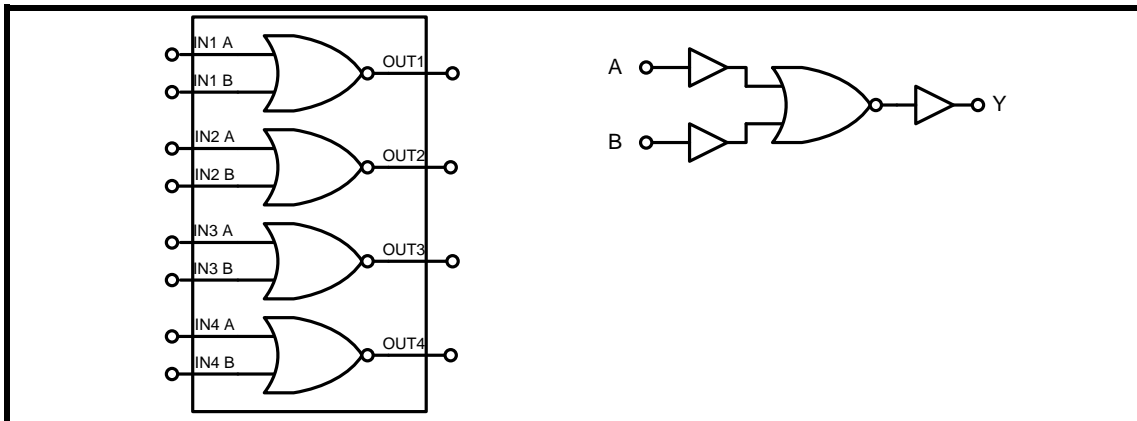


Figure 1. CHT-74021: simplified block diagram.

## Absolute Maximum Ratings

Supply Voltage  $V_{DD}$  to GND -0.5 to 6.0V  
 Voltage on any Pin to GND -0.5 to  $V_{DD}+0.5V$

## Operating Conditions

Supply Voltage  $V_{DD}$  to GND 3.3V to 5V ( $\pm 10\%$ )  
 Junction temperature  $-55^{\circ}C$  to  $+225^{\circ}C$

### ESD Rating (expected)

Human Body Model 1kV

## DC Electrical Characteristics

Unless otherwise stated:  $V_{DD}=5V$ ,  $T_j=25^{\circ}C$ . **Bold underlined** figures indicate values valid over the whole temperature range ( $-55^{\circ}C < T_j < +225^{\circ}C$ ).

Parameter	Condition	Min	Typ	Max	Units
Supply voltage $V_{DD}$		2.97		5.5V	V
Quiescent current $I_{DD}$	$V_{DD} = 3.3V$ , $T_j = -55^{\circ}C$			4	nA
	$V_{DD} = 5V$ , $T_j = -55^{\circ}C$			13	
	$V_{DD} = 3.3V$ , $T_j = 225^{\circ}C$			<b><u>2340</u></b>	
	$V_{DD} = 5V$ , $T_j = 225^{\circ}C$			<b><u>2550</u></b>	
Minimum HIGH level output voltage $V_{OH}$	$V_{DD} = 3.3V$ , $I_{OH} < 4mA$ (source)	<b><u>2.7</u></b>	3.04		V
	$V_{DD} = 5V$ , $I_{OH} < 4mA$ (source)	<b><u>4.6</u></b>	4.82		
Maximum LOW level output voltage $V_{OL}$	$V_{DD} = 3.3V$ , $I_{OL} < 4mA$ (sink)		0.28	<b><u>0.5</u></b>	V
	$V_{DD} = 5V$ , $I_{OL} < 4mA$ (sink)		0.20	<b><u>0.4</u></b>	
Minimum HIGH level input voltage $V_{IH}$	$V_{DD} = 3.3V$	<b><u>2.4</u></b>	2.10		V
	$V_{DD} = 5V$	<b><u>3.7</u></b>	3.49		
Maximum LOW level input voltage $V_{IL}$	$V_{DD} = 3.3V$		1.72	<b><u>1.5</u></b>	V
	$V_{DD} = 5V$		2.16	<b><u>2.0</u></b>	
Input leakage current (source / sink) $\pm I_i$	$V_I = V_{CC}$ or GND, $V_{DD} = 3.3V$		$\pm 1$	<b><u><math>\pm 35</math></u></b>	nA
	$V_I = V_{CC}$ or GND, $V_{DD} = 5V$		$\pm 2$	<b><u><math>\pm 37</math></u></b>	

## AC Electrical Characteristics

Unless otherwise stated: VDD=5V,  $T_j=25^\circ\text{C}$ . **Bold underlined** figures indicate values valid over the whole temperature range ( $-55^\circ\text{C} < T_j < +225^\circ\text{C}$ ).

Parameter	Condition	Temperature	Min	Typ	Max	Units
Propagation delay time from A or B to Y <sup>1</sup> $t_{PHL}$	$C_L=50\text{pF}$	$T_j=-55^\circ\text{C}$		9	12	ns
		$T_j=25^\circ\text{C}$		11	14	
		$T_j=225^\circ\text{C}$		15	<b><u>19</u></b>	
Propagation delay time from A or B to Y $t_{PLH}$	$C_L=50\text{pF}$	$T_j=-55^\circ\text{C}$		14	17	ns
		$T_j=25^\circ\text{C}$		15	20	
		$T_j=225^\circ\text{C}$		17	<b><u>22</u></b>	
Output transition time High to Low $t_{THL}$	$C_L=50\text{pF}$	$T_j=-55^\circ\text{C}$		13	17	ns
		$T_j=25^\circ\text{C}$		14	18	
		$T_j=225^\circ\text{C}$		17	<b><u>22</u></b>	
Output transition time High to Low $t_{TLH}$	$C_L=50\text{pF}$	$T_j=-55^\circ\text{C}$		19	25	ns
		$T_j=25^\circ\text{C}$		20	26	
		$T_j=225^\circ\text{C}$		23	<b><u>30</u></b>	

<sup>1</sup> Input A is 1% to 2% faster than input B.

### AC Electrical Characteristics (cntd)

Unless otherwise stated:  $V_{DD}=3.3V$ ,  $T_j=25^{\circ}C$ . **Bold underlined** figures indicate values valid over the whole temperature range ( $-55^{\circ}C < T_j < +225^{\circ}C$ ).

Parameter	Condition	Temperature	Min	Typ	Max	Units
Propagation delay time from A or B to Y $t_{PHL}$	$C_L=50pF$	$T_j=-55^{\circ}C$		18	24	ns
		$T_j=25^{\circ}C$		19	27	
		$T_j=225^{\circ}C$		23	<b><u>37</u></b>	
Propagation delay time from A or B to Y $t_{PLH}$	$C_L=50pF$	$T_j=-55^{\circ}C$		17	23	ns
		$T_j=25^{\circ}C$		19	26	
		$T_j=225^{\circ}C$		23	<b><u>35</u></b>	
Output transition time High to Low $t_{THL}$	$C_L=50pF$	$T_j=-55^{\circ}C$		20	26	ns
		$T_j=25^{\circ}C$		21	28	
		$T_j=225^{\circ}C$		27	<b><u>36</u></b>	
Output transition time High to Low $t_{TLH}$	$C_L=50pF$	$T_j=-55^{\circ}C$		23	30	ns
		$T_j=25^{\circ}C$		24	32	
		$T_j=225^{\circ}C$		26	<b><u>34</u></b>	

### AC Waveforms

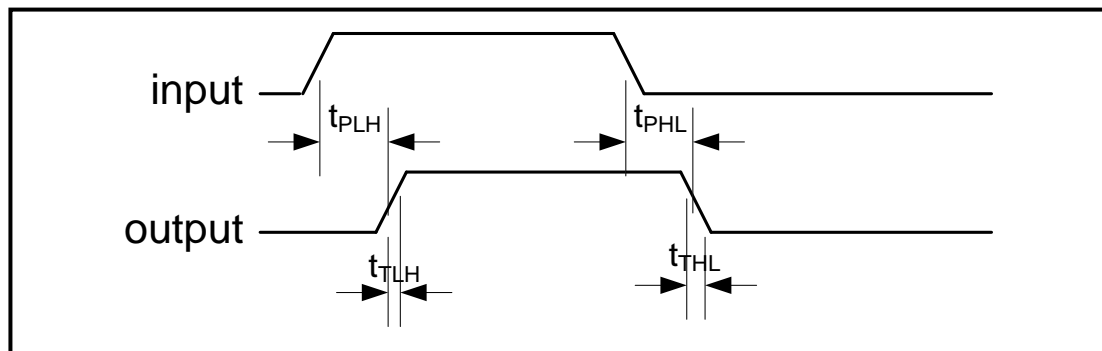
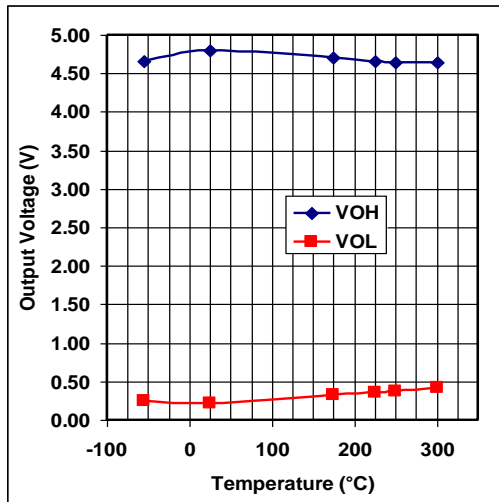
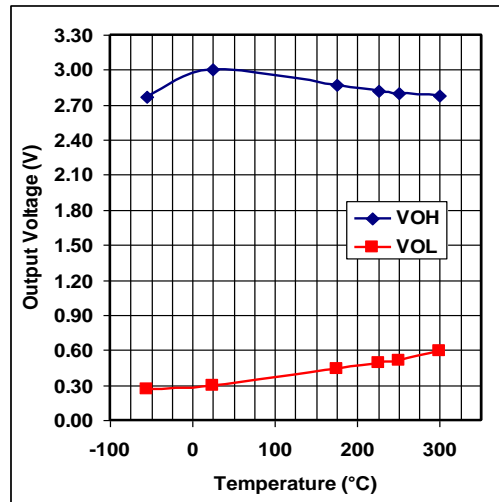


Figure 2. AC Waveforms

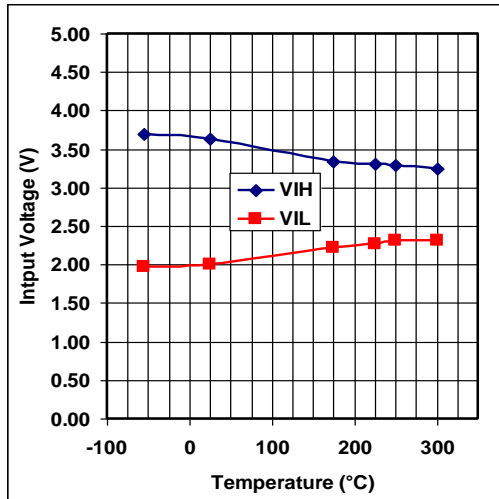
**Typical Performance Characteristics**



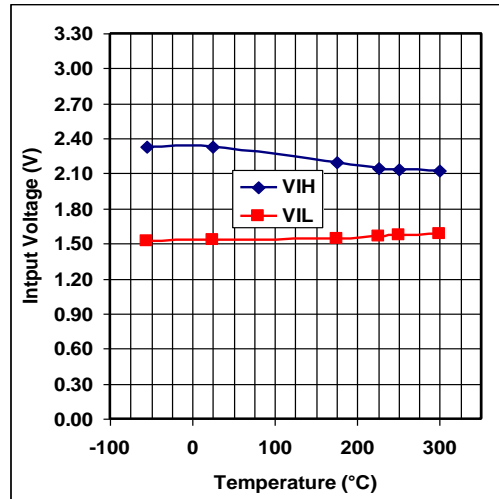
Output voltage levels versus temperature, V<sub>DD</sub> = 5V



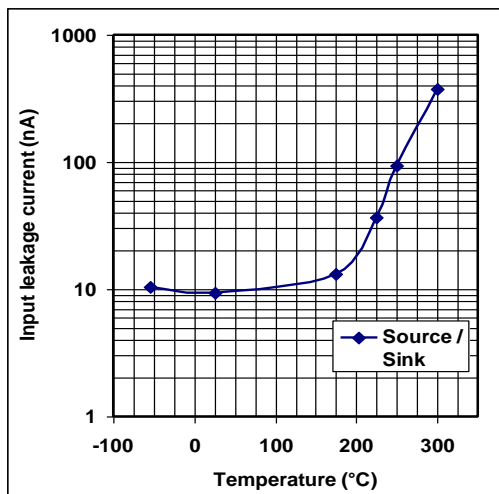
Output voltage levels versus temperature, V<sub>DD</sub> = 3.3V



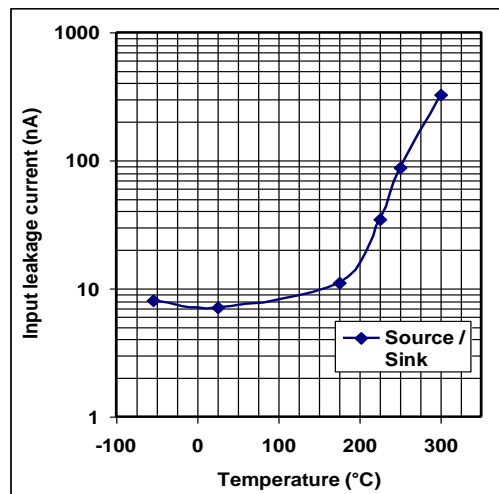
Input voltage levels versus temperature, V<sub>DD</sub> = 5V



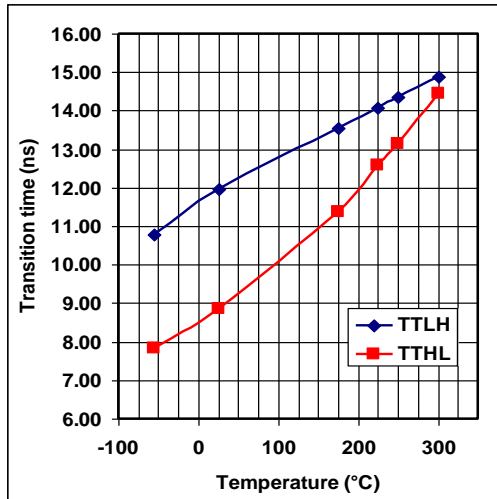
Input voltage levels versus temperature, V<sub>DD</sub> = 3.3V



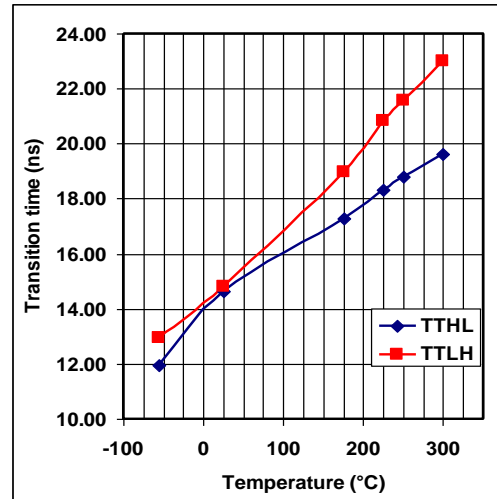
Input leakage current versus temperature, V<sub>DD</sub> = 5V



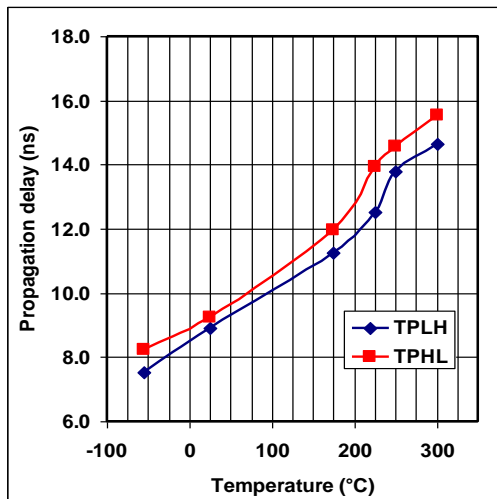
Input leakage current versus temperature, V<sub>DD</sub> = 3.3V



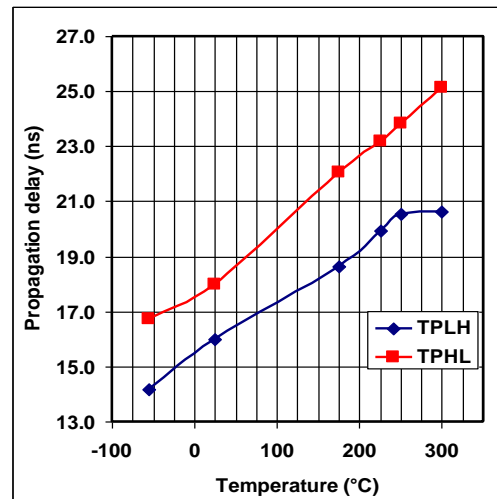
Transition times versus temperature,  
 $V_{DD} = 5V$



Transition times versus temperature,  
 $V_{DD} = 3.3V$



Propagation delays versus temperature,  
 $V_{DD} = 5V$

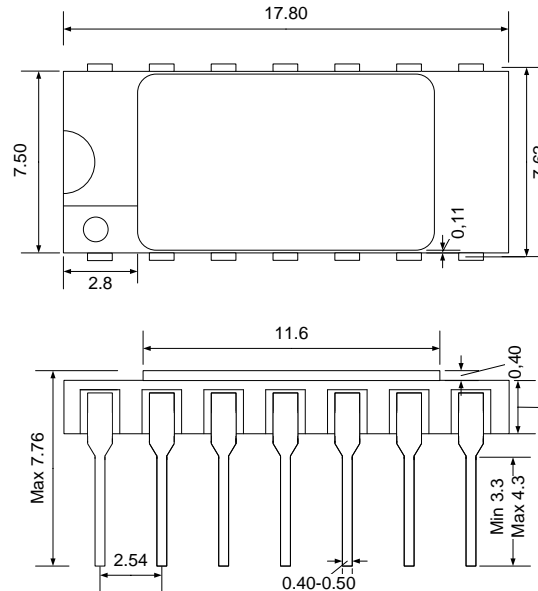


Propagation delays versus temperature,  
 $V_{DD} = 3.3V$

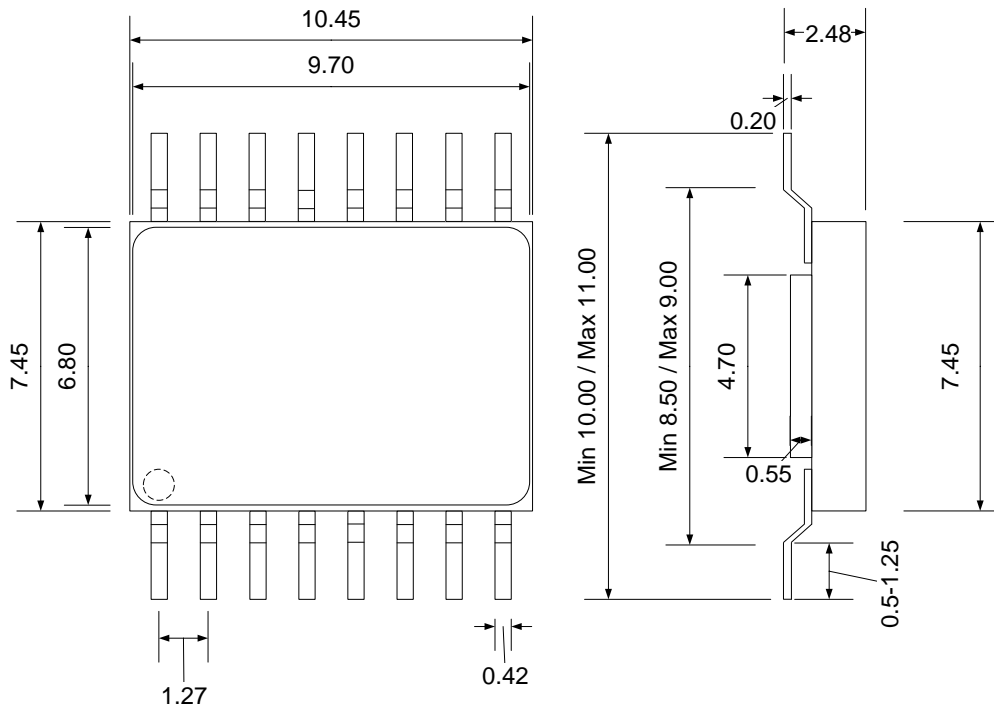
## Ordering Information

Ordering Reference	Package	Temperature Range	Marking
CHT-74021-CDIL14-T	Ceramic DIL14	-55°C to +225°C	CHT-74021
CHT-74021-CSOIC16-T	Ceramic SOIC16	-55°C to +225°C	CHT-74021

## Package Dimensions



*Drawing CDIL14 (mm +/- 10%)*



*Drawing CSOIC16 (mm +/- 10%)*



## Contact & Ordering

CISSOID S.A.

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<b>Representatives</b>	Visit our website: <a href="http://www.cissoid.com">www.cissoid.com</a>

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